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UCS Research Review



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Designed by Alice Hunt

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Editorial

It is no exaggeration to say that editing this research journal is one of the most enjoyable, humbling, and stimulating aspects of my role at UCS. It is truly inspiring to witness the intellectual energy within these walls and the willingness of our community to engage in explorations that stretch far beyond their day-to-day work. From the initial call for papers to the final edits, the process remains purposefully flexible—we aim to embrace the idiosyncratic nature of independent, creative, and critically engaged minds, a quality that undoubtedly defines our school. This edition, I hope, is a celebration of just that.

This issue brings some exciting new additions that I trust readers will enjoy: a section featuring short articles and a guest-contributor paper. In the short articles section, **Joe Jones** (Junior Branch, KS2 teacher) offers an engaging reflection on *The Art of Listening*, while **Darragh Woods** (Senior Branch, Geography Department) explores the intersection of AI and education in his article on *Two-tier Assessments*. He delves into the tandem role of traditional ‘assessment of learning’ and the emerging possibilities of human-AI collaboration in ‘assessment as learning’.

The first extended piece comes from **Kumar Viswanathan** (Senior Branch, Philosophy Department), who presents a beautifully written essay titled *Liberal Education: Hirst’s Misuse of Wittgenstein*. In this thought-provoking piece, Kumar critiques Paul Heywood Hirst’s interpretation of liberal education and examines its implications for formal educational processes. A must-read for this edition!

The journal then moves to longer, more traditional pieces of academic research in education. The first, stemming from my own work as Head of Research at UCS, is titled *Education for Creativity: Enhancing Teachers’ Capacity to Foster and Develop Students’ Creative Qualities in the Context of Formal Education at UCS*. In this paper, I propose a framework to guide teachers—across all levels and specialisms—in fostering the qualities and skills that are increasingly vital in a world facing rapid AI-driven automation.

Cecilia Zhu (Senior Branch, Mathematics Department) follows with an insightful discussion on the importance of adapting to cultural diversity in educational settings. Her article explores strategies

for delivering *language-responsive teaching to EAL students in Mathematics*. Finally, we warmly welcome **Ignacio Esclamado Cadenas** (Senior Branch, Learning Support Department), a first-year member of staff, who contributes a fascinating study on *PTSD, Sleep, and Memory*.

A particularly original and timely element in this edition is **Bethany Moxon’s** research on the impact of the menstrual cycle on teachers’ emotions. Beth, Director of Sixth Form at Uckfield College and a menstrual cycle coach, first shared her work during our time together at the MSc in Teacher Education at the University of Oxford. I was delighted to invite her to contribute to this issue, not only to foster greater collaboration between UCS and other schools but also to bring fresh perspectives to academic research.

The societal changes we currently face demand that teachers engage more deeply with what education *should* be. It is not simply about keeping pace with the complex developments in cognitive neuroscience or navigating the revolution (and potential threat) that Artificial Intelligence brings to education. It is also about addressing the unprecedented mental health crisis among young people, engaging with emerging narratives of intersectionality, representation, and the decolonisation of ideas. Crucially, it involves acknowledging that teachers are people too—individuals under immense professional pressure and accountability—who also deserve research-driven insights on how to remain healthy, happy, and fulfilled. I am hugely grateful to Beth for sharing her admirable work with our community.

Finally, I would like to extend my deepest gratitude to **Charlotte Hawes**, **Helena Yovichich**, **Ami Mistry**, and **Ben Mace** for their excellent book reviews. My heartfelt thanks also go to the Editorial Board for their rigorous and generous review of the articles. This year’s team included **Darragh Woods**, **Michael Edwards**, **Kumar Viswanathan**, **Joe Jones**, and **Paul Dawson**. I hope you all enjoy this edition.

Yours,

Adriane Martini

Adriane Martini is a Teacher of Psychology and Head of Research at UCS Senior Branch.



Short Articles

Hark! Have you really been listening?

By Joe Jones

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To be a good teacher is to be a good listener. Rather than immediately discuss this claim, which does not stoke much controversy, and is supported by recent surveys of students and other stakeholders (McKnight et al 2016, Ziebart 2017), I want to identify and discuss an obstacle to our listening well.

The listener's task is daunting. They must: attend to the speaker's 'tone of voice' in order to be receptive to subtle emotion; notice the speaker's 'choice of words' which can be 'revealing'; observe the speaker's body language; apply self-awareness 'to monitor carefully' their 'own reactions, of emotion or judgement' to what is being said (pg 49-50). I quote from Whitmore (2011) and have not attempted to capture all the advice he gives. It would not be difficult to produce a (strikingly) similar list from various other authors and authorities. Nearly 140 years ago, Lippincott's magazine lauded the true's listener's habit of 'entering into our thought and mood with a fulness of sympathy and understanding...!' (Lippincott, 1885)

All this before the listener actually focuses on the words being uttered!

The particular obstacle I want to discuss is the multi-tasking that listening seems to demand. Whilst aiming to listen well to a student by reflecting carefully about what they are saying and how they are saying it, I am apt to stop attending to their actual words. Bandwidth has been exceeded. Alternatively, I could focus exclusively on the content of what is being said, and that might be necessary in some circumstances - for example, if they aren't terribly clear - but then I am also likely to have failed to pick up on a lot of other nuances in this encounter. A further alternative is to interrupt the student to ask a clarifying question or simply to ask them to pause whilst I take stock of what has so far been said. This is to alter what would otherwise have followed and the interruption itself might be fatal to the student's line of thought.

I want to consider some possible responses to this problem. The first is to note that practice and the expertise we gain from it plays a role in allowing us to carry out complex tasks with less conscious thinking. Eagleman illustrates this broad principle by measuring brain activity in a novice and expert cup stacker. The expert is able to carry out the complex task with very little brain activity compared to the novice (Eagleman, 2015). Whether expertise won by experience extends to a field as complex as listening and understanding a speaker is a moot point. For the

sake of argument, let us say here that practice can make us a better listener, but not in every subskill mentioned above and certainly not in making the 'right' decision about which subskill or set of them to try to use in any given moment.

The second possible response then is to admit that not all bases can be covered at the same time. Instead, the coach or teacher can choose to focus their efforts on one aspect of the listening discipline. One example of this is a technique which Freud pioneered: 'evenly suspended attention' (Epstein, 1984, pg 194). Here no particular effort should be made to attend to, think about, or remember a particular utterance of the speaker. Instead, the listener should, as far as they are able to, attend equally to everything in their encounter with the speaker, all at once. In a striking metaphor, Freud wrote that the analyst "must adjust himself to the patient as a telephone receiver is adjusted to the transmitting microphone." (Freud op.cit. Epstein, 1984, pg 95) This might allow an understanding of the patient that focused attention and reflection would not.

It's worth recognising how sophisticated a technique Freud is proposing a listener (albeit of a very special type) include in their toolkit. For who can maintain evenly suspended attention in this way without the mind seizing upon some item or other that most takes its fancy? Epstein (1984) points out that scholars have been keen to point out the similarity between Freud's project and Buddhist meditation practices. If such a technique is necessary to understand the person who is speaking in a comprehensive way then the picture that emerges of a 'good listener' is more complicated and perhaps less stable and unitary than we were first inclined to think.

Let's pause here for a moment to consider the picture of a 'good listener', which we come across so frequently in our culture and are likely to share, at least in a hazy outline. Whitbourne (2021) begins her own list of characteristics by pointing out to the reader that they will have had their own experience of talking to a person who "either looks at you or makes empathic

comments allows you to feel comfortable with this individual and, therefore, more likely to open up further." The 'good listener', then, is, above all things, a person who makes you want to talk. On this criterion, a devastatingly effective prosecutor is not a 'good listener' though, of course, they are a very good listener: they will recall your utterances verbatim, understand the significance of what you say, and astonish with their attention to minor details of your account. Conversely, the 1960s chatbot *Eliza*, which notoriously made people very comfortable opening up about their problems (Varley, 2016), was a 'good listener' though it could not understand anything you typed into its interface.

What becomes increasingly clear is that the 'good listener' is a less useful stock character for the purposes of professional development than we might have at first hoped. Consider the time constraints of a lesson and we might be less eager to encourage our students to 'open up', but at the same time we do not want to mark ourselves as someone to whom you must always speak concisely. In the event of listening to a child disclose a safeguarding incident, we might deliberately avoid thinking about what has not been disclosed, precisely because it can be so demanding to suspend judgement and reaction and recall as precisely as we can the words themselves that have been uttered.

I am inclined to think of listening as being akin to a diverse set of muscles. Any exercise is better than none. The true specialist though - the Freudian analyst or the ballet dancer - is likely to experience some distorting wastage through underuse. Exhortations to listen better, made so frequently that it is easy not to give them our full attention, might benefit from greater sensitivity to context and the purpose of the encounters a professional is likely to enter into because of their role.

References



Two-tier assessment: sink or swim?

By Darragh Woods

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1. Introduction

The University of Sydney recently made headlines for introducing a two-tier assessment policy for student assignments. In their article describing the move, Bridgeman et al. (2024: n.p.) highlight that a ‘two-lane approach to assessment’ within the university ‘reflects the reality of teaching, learning, assessment and preparing students for their careers in an age where technologies such as generative AI are pervasive and ubiquitous’. Indeed, Bridgeman et al.’s (2024) assertion that education—and moreover, educational assessment—is changing appears a sensible suggestion. However, if schools are to prepare students for university (among, of course, other possible destinations for leavers), how should we interpret changes in the higher education landscape such as this? More alarmingly, if high-stakes summative assessments at GCSE and A-Level remain, how can schools and colleges prepare students for novel assessment landscapes at undergraduate level and beyond?

Across my Master’s degree in Learning and Teaching at the Department of Education, University of Oxford, I explored the role of generative artificial intelligence (here, referred to as ‘AI’ for simplicity) in the professional lives of geography teachers and worked with colleagues to collaboratively develop teaching and learning across the degree course. As part of this, I often found myself questioning how we should instruct

students to use AI. Indeed, there are many potential benefits but also some drawbacks (Farrokhnia et al., 2023) and the Department for Education (DfE, 2023) has some general guidance for schools and teachers. In this short reflexive article, I will outline some key ideas in relation to one recent response to this challenge, in the context of the University of Sydney.

2. Discussion

Two-tier (or two-lane) approaches make a clear distinction between two different types of assessment. Lui and Bridgeman (2023: n.p.) highlight that the first type considers ‘examples of assured ‘assessment of learning’, whilst the second concerns itself with ‘examples of human-AI collaboration in ‘assessment as learning’ (see Figure 1). Indeed, this distinction is easy to comprehend. The first is reminiscent of assessments taken in controlled conditions definitively without the use of AI—paper tests taken in class or GCSE/A Level examinations—whilst the second is an often lower-stakes assessment where AI use would be permitted for certain tasks, for example, a piece of creative classwork or homework. In principle, this is a valid and effective way forward in a world of commercially available AI.

However, permitting AI use for *certain tasks* is the challenge. Lui and Bridgeman (2023) provide a list of these permissible opportunities, but how

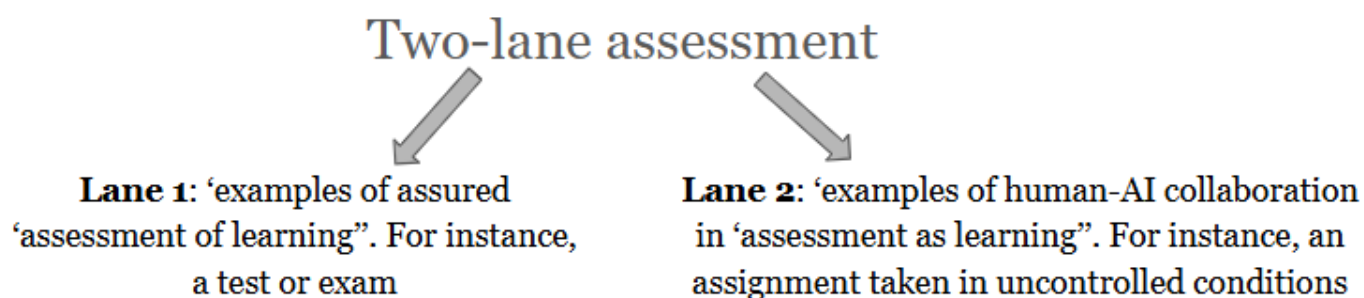


Figure 1: Overview of two-tier assessment (Adapted from Lui and Bridgeman, 2023).

can we (as teachers and parents) be confident that students are staying within the bounds of the second lane? I will address this question at the end of this article. First, allow me to offer a fictitious example as a vehicle to highlight the risks associated with *not* using a two-tier system.

A class is a written homework assignment that will be marked by the teacher. Paul, along with a significant majority of the class, abide by the rules whilst a small minority, including John, fall short of time and use ChatGPT to write their essay for them. John tells ChatGPT that he is an A-Level student and asks the model to provide an essay summarising the new concept. The model obliges, but its output is quite obviously not written by a human (see Appendix A). Moreover, a scan by detection software GPTZero reveals that the paragraph is written by AI (see Figure 2).

n.p.)) can 'humanise AI text' to evade detection. Appendix A shows the refined text, which, when analysed the same detection software provides a negative result (see Figure 3). In effect, this means the same AI-produced source text can be converted into a form that avoids detection without substantial human intervention and within minutes.

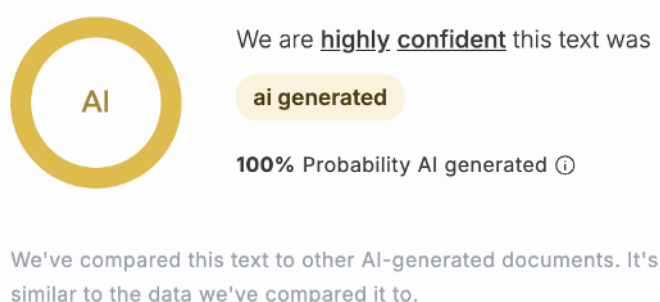


Figure 2: Result of scan of ChatGPT produced text (Source: GPTZero).

Despite this, there are ways to get around detection. It has previously been highlighted that traditional plagiarism detectors accusations of academic dishonesty can be successfully challenged (see Woods, 2023). Equally, other software (for example, AI Text Converter (n.d.,

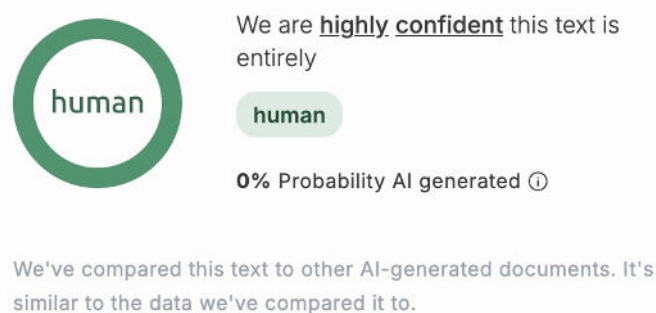


Figure 3: Result of scan of refined text (Source: GPTZero).

This essay is not a criticism of AI-detection softwares. Rather, it is true that detection has come a long way since ChatGPT's inception, and one may conservatively argue that this will continually develop. But how may this impact Paul, the honest student? It may be the case that Paul's response is better than John's machine-inspired answer, but it may also be the case that John's is somewhat superior. If the latter is true, this creates a dichotomy for the teacher: does John understand the topic more than Paul? Most certainly not. Instead, John likely has little understanding of the topic and the only way to reveal this is by viva (a verbal assessment of understanding), relying on John to admit he used AI, or comparing this assignment to John's previous work. I might suggest that none of these are scientific methods.

Perhaps, then, the question is how may this impact John? If he succeeds, John won this split of the race but is far from winning the marathon. Indeed, he is likely to struggle more as the course continues and his un-checked knowledge makes a weak foundation for future progress. A two-lane assessment policy, given the detection issues identified above, will not *so/ve* the problem in the same way a speed limit on a country road with no speed cameras will not necessarily *so/ve* the problem of speeding. However, making clear the rules around AI for assignments reduces the uncertainty.

This reduced ambiguity benefits both Paul and John. Indeed, they are both empowered to use AI as a productive learning tool, in preparation for a higher education and employment landscape that is embracing the technology. Furthermore, they are both aware of the value of their own learning—away from the AI—and are both clear that the true checks for understanding are not found in lane 2.

3. Conclusions

Two-tier assessment is certainly not an Olympic triathlete, but it swims farther from the shore than may be expected. Given the example above if there is the possibility AI may be used for an assignment, we should not be startled when it is employed. Two-tier assessment clarifies the rules for students and prioritises lane 1 assessments which comprehend true student understanding. Both Paul and John both stand to gain in the long-term by knowing that their learning is being monitored accurately.

Appendices and References



Long Articles



Liberal Education: Hirst's misuse of Wittgenstein

By Kumar Viswanathan

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1. Introduction

Paul Heywood Hirst (along with his colleague Richard Peters) reinvigorated philosophy of education in the UK in the 1960s and inspired thirty years of research into the concept and content of education. In 1964 Hirst co-founded the Philosophy of Education Society of Great Britain, and in 1971 he became Professor of Education and Head of the Department of Education at Cambridge University. A special issue of the *Journal of Philosophy of Education* celebrating the writing and professional life of Hirst was published in 2023. Of Hirst's many writings, the most famous is his 1965 essay 'Liberal Education and the Nature of Knowledge'. Although he changed his mind about aspects of the paper in the 1970s, its interpretation of liberal education in terms of forms of knowledge continues to be of more than historical interest.¹ The interpretation springs not from modern libertarianism (as so many contemporary accounts do) but from an imaginative blend of ancient Greek philosophy and twentieth century ordinary language philosophy. Hirst openly acknowledged that he found support for his main thesis in the ordinary

¹ Although Hirst eventually came to think that education should be seen as concerned more with social practices than with knowledge, he held on to many of his views about forms of knowledge. 'I now, not surprisingly, consider the notion of Liberal Education for which I argued in the 1960s and 1970s to be misconceived in certain important respects...I still hold that forms of theoretical knowledge can be distinguished in terms of the logical features and truth criteria of the propositions with which they are primarily concerned. I still consider the propositional elements in moral, religious and aesthetic understanding to be central to the proper characterisation of these areas' (Hirst, 1993, 196-197). It is these theses, which Hirst continued to uphold, that are put under scrutiny in my essay.

language philosophy of Wittgenstein and his notion of a language-game in particular. The present paper argues that Hirst's application of Wittgenstein's philosophy is a misapplication and that his notion of liberal education lacks coherence. However, partly thanks to Hirst, we can still look to the Greeks and to Wittgenstein to learn something about liberal education.

2. Hirst's 'Liberal Education and the Nature of Knowledge'

Hirst opens his essay by stating that it is generally accepted that a liberal education is not vocational, not exclusively scientific and not specialist.² But he wants to put forward a more positive and practical concept of liberal education. It is a product of his agreement and disagreement with strands of ancient Greek philosophy and a twentieth century Harvard Committee Report.

In Hirst's reading of the Greeks, a human individual leads a good life only if the individual's mind fulfils its function by being engaged in the pursuit of knowledge. A knowledgeable life is guided by what is finally true and ultimately real and not by illusions and uncertainties.³ A liberal education is the pursuit of knowledge simply for

² Hirst later added that this notion of liberal education is not a 'total education' or a 'general education' because it seeks to develop only a student's intellect. It does not try to develop a student's character or physical qualities. It excludes the skills of a second language. And it has a lack of concern with moral commitment. (See 1974(b), 96).

³ This element of Hirst's summary of Greek philosophy is patently Platonic. See Ozolins, 2021, 859.

the sake of the fulfilment of mind and not for the sake of its vocational benefits. It is liberal - in the sense of liberating - because it 'free[s] the mind to function according to its true nature' (Hirst, 1973, 89). Hirst's rather sweeping criticism of the Greek notion of liberal education is that it is underpinned by philosophical doctrines that many would now find spurious.⁴

The Harvard Committee Report entitled *General Education in a Free Society* does not rely on such doctrines. The Report claims that the aim of a liberal education is the cultivation of certain mental abilities: to think effectively, to communicate thought, to make relevant judgements and to discriminate among values. Hirst criticises The Report for overlooking the fact that 'the description and evaluation' of any one of these mental abilities 'must be in public terms occurring in public language' (Hirst, 1973, 93). A notion of liberal education will satisfy that condition only if it is built on the publically available forms of knowledge with which the mental abilities are concerned. Hirst's other problem with The Report is that it assumes that all successful demonstrations of a mental ability can be judged according to the same criteria. However, effective thinking in aesthetic appreciation is not the same as effective thinking in mathematics.

Hirst does not disagree with the Greeks that a liberal education frees the mind or with the Harvard Report that a liberal education develops mental abilities. But his criticisms of both accounts motivate him to devise an alternative notion of liberal education. It is based on what he calls 'forms of knowledge'. 'By these is meant ... not collections of information, but the complex ways of understanding experience which man has achieved, which are publicly specifiable and which are gained through learning' (*ibid*, 96).⁵ The examples Hirst gives of forms of knowledge

are mathematics, physical sciences, human sciences, history, religion, literature and the fine arts, and philosophy (see 105, 1973). Each form of knowledge has four distinguishing features. (1) There are certain key concepts in each form that are characteristic of it. (2) There is a distinctive logical structure in each form arising from the relations between the concepts. (3) There are particular criteria according to which each form's statements are testable against experience (Hirst calls this feature the central one (*ibid*, 103)). (4) There are particular techniques and skills for acquiring knowledge in each form. Hirst accepts that the different forms of knowledge have common features as well, and that some subjects (e.g. geography) involve more than one form of knowledge. He thinks that his notion preserves the objectivity promoted by the classical notion, but by using not suspect philosophical doctrines but public criteria relating to the forms of knowledge. In sum, a liberal education according to Hirst is the development of mind as determined by certain forms of knowledge, which have different effects on our different mental abilities.

As I said, Hirst's essay was influenced by ordinary language philosophy, which was in its heyday when Hirst wrote the piece. While at Oxford he attended lectures and seminars given by luminaries of the movement such as Anscombe, Ryle, Hare, Strawson and Austin.⁶ But the philosopher who had the greatest impact on the essay was probably Wittgenstein, whom Hirst first studied in the late 1950s. He later reported that

Wittgenstein's Philosophical Investigations, with its talk of "forms of life" and "language games", I read as supporting my view of logically distinct domains of knowledge and understanding. (Hirst, 2010, 163)

He also said that

[w]hat I took from Wittgenstein in particular were essentially three theses that I adapted to my own purposes. First, that philosophy is concerned with seeking to help our

⁴ The purported doctrine that seems to trouble Hirst most of all is metaphysical realism, which (for him) is the idea that there is a correspondence between the knowing mind and objective reality. He would seem to prefer to conceive knowledge as the understanding of experience rather than the understanding of reality. Hirst is very confusing on knowledge and reality but I will not try to clear this up now.

⁵ That one of Hirst's most direct statements about a form of knowledge is actually about understanding is puzzling but telling. It is a symptom of the conflation of truth and meaning that plagues his whole account.

⁶ White and Bridges, 2023, 5

understanding in all our forms of discourse by mapping carefully the concepts and their relationships embedded in our use of language, thus helping us to remove the confusions and contradictions that distort our understanding. Second, that concepts in any area of understanding are to be found in the rules for our use of words rather than any notion that they must be labels of objects of any kind, physical, mental, spiritual, or whatever. Third, that the “private language argument” shows that all understanding, let alone all judgement of truth, is dependent on agreement in the application of the concepts in public discourse. (*ibid*, 164)

The third of these points might explain Hirst’s main complaint against the Harvard Report. Most commentators read Wittgenstein’s private language arguments as a defence of the idea that there is no language that is so private as to be publicly inaccessible in principle. Perhaps Hirst thought that the Harvard Report’s picture of mental abilities contradicts the private language arguments and that we cannot talk about such abilities without referring to publicly identifiable forms of knowledge. If so, Hirst seems to me to have assumed and not shown that the Harvard Report is guilty as charged.

At various points in his career after the publication of ‘Liberal Education and the Nature of Knowledge’ Hirst returned to his interpretation of Wittgenstein and ideas about forms of knowledge. His position on both matters evolved. In his paper ‘Language and Thought’ many of the claims that were made in the original paper about forms of knowledge are now made about discourses (e.g. moral discourse, scientific discourse).

Wittgenstein’s notion of a language-game is, I think, enormously to the point here, for it seems to me one can most profitably think of the different modes of discourse as language-games, each distinct in their rules for the forming of expressions that will carry out the appropriate functions. (Hirst, 1974(c), 81)

In ‘The Forms of Knowledge Re-Visited’ he provides some further details about this (if we suppose, as he clearly leads us to believe, that ‘forms of knowledge’ and ‘discourses’ are two sides of the same coin), saying that forms of knowledge are distinguishable by their ‘types of concepts, logical structures and truth criteria’ (Hirst, 1974(b), 91). It is clear that he thinks that one of the main indicators of a form of knowledge is a distinct type of truth: ‘The labels that I have used for distinct forms of knowledge are to be understood as being strictly labels for different classes of true propositions’ (*ibid*, 87). He underlines his belief that the identity of a form of knowledge is tied to a type of truth when he says that even the arts are ‘cognitive’, suggests that they have ‘unique truth criteria’, and claims that works of art ‘have properties logically equivalent to those of propositions’ and are open to ‘objective judgement’ (see *ibid*, 87).

3. Forms of knowledge and language-games

But how true to Wittgenstein is Hirst’s essay? More specifically, does Wittgenstein’s talk of language-games really support Hirst’s concept of forms of knowledge? I will argue that any support is superficial at best.

In the previous section I listed Hirst’s examples of forms of knowledge. The list consists of academic subjects (mathematics, history, literature, philosophy), academic and creative subjects (fine arts), academic and spiritual subjects (religion) and sets of academic subjects (the physical sciences and the human sciences). A form of knowledge, then, is actualised partly or entirely as one or more academic subjects. I say that with a little hesitation because this is a motley list; because Hirst himself later amended the list; and because he struggled to decide whether and how forms of knowledge map onto academic subjects as taught in schools and universities.⁷ Nevertheless, the vast majority of what Hirst says about forms of knowledge indicates that he believes that academic subjects are real

⁷ On the last two reasons, see Hirst, 1974(b), 86-87 and 96-99 respectively.

manifestations of them. And it is hard to see how the notion of a form of knowledge would be of any educational significance if it were otherwise. All in all, Hirst is effectively arguing that a form of knowledge as an academic subject or set of academic subjects is very much like a Wittgensteinian language-game in that both represent some sort of logically distinct domain. There are some parallels between academic subjects and language-games. However, as I now want to argue, they do not go anywhere near as deep as Hirst supposes. If I am right about this then Hirst's notion of a form of knowledge and in turn his concept of liberal education are not completely coherent.

Wittgenstein had previously held that language is to be understood as a calculus that operates according to rigid and closed rules. But he started having doubts about that partly because he was becoming persuaded by an analogy between language and games. In chess we move each piece according to the rules of the game for specific purposes. The rules of the game are not as rigid and closed as the rules of a calculus are, such that how a chess piece should be moved is always conclusively determined. There are a great many games (including video games, board games, physical games, role-playing games) with different rules and purposes. Similarly, in language, we use a linguistic expression (a word, a sentence, etc.) as part of a regulated activity for one or more purposes. The rules that govern the use of the linguistic expression are relatively loose and open-ended. The activities of which linguistic expressions are a part take a great multiplicity of forms and serve a great variety of purposes.

One of the other things the analogy is meant to highlight is the fact that language is used, just as a game is played, against a background of natural facts and human interests in the absence of which the use or play would very likely be pointless. The analogy proved to be such a rich source of ideas that Wittgenstein began speaking of 'language-games' to draw attention to the practical nature of language and to combat overly theoretical explanations of it.⁸ What is most noteworthy in

the present context is that the use of a linguistic expression depends on the rules of the relevant language-games and is unintelligible outside of all of them (just as talk of offside in football would be unintelligible without football).

Academic subjects and language-games are similar in some respects, including in some of the ways that Hirst mentions (i.e. in terms of types of concepts, logical structures and truth criteria). We might use types of concepts in one academic subject that we would never use in another, and the same can be true when it comes to language-games. We might also follow a type of logic or form of reason in one academic subject in a way that we would not do in another, and this too is a feature of different language-games.⁹ We might sum up these two comparisons by saying that the various standardised forms of thought and action peculiar to an academic subject are similar to the various regulated linguistic expressions peculiar to a language-game. Moreover, different academic subjects can and do serve different purposes, just as different language-games do. None of these similarities, however, alters the fact that it would be highly misleading to describe an academic subject as a language-game. There are a number of reasons why.

First, there is the issue of meaning. Wittgenstein's talk of language-games is intended above all to shed light on meaning. He refers to them in the process of clarifying, for example, what a word means, what it does not mean, why it might have come to have the meaning it has, how its meaning in one context compares with its meaning in a different context, and how its meaning compares with the meanings of other closely related words. Academics (who are not ordinary language philosophers) do not pursue their

⁹ Hirst says the points about types of concepts and logical structures were never meant as strongly as his readers thought. 'It was no part of the thesis [regarding forms of knowledge] even in its earliest formulation that the forms of knowledge are totally independent of each other, sharing no concepts or logical rules... The conceptual and logical elements shared between forms and the inter-relations they indicate are considerable' (1974(b), 89). The next sentence in the same paragraph goes some way to reinforcing the point made in the original article that it is mostly in terms of truth criteria that forms of knowledge are distinguishable. 'Yet it remains the case that every proposition can be distinguished by the different kinds of truth criteria it involves' (1974(b), 89).

⁸ For this outline of a language-game, I am indebted to Chapter 3 of Hacker (2009).

subjects in order primarily to resolve problems of meaning. Biologists explain living things and the environments within which they exist. Art historians interpret works of art and account for their origins. These groups of academics are not solely or mainly concerned with the meanings of words, sentences and the like.

Second, language-games, as Wittgenstein speaks of them, tend to be smaller spheres of human activity than academic subjects. The concept of a language-game is rather vague in Wittgenstein's writings (it was after all derived from an analogy), but it is clear from his examples of language-games involving words, sentences, linguistic acts (e.g. lying) and other activities which depend on language (e.g. forming a hypothesis) that they relate to a narrowly circumscribed area of human behaviour. Academic subjects, on the other hand, are larger and more complicated spheres of human activity which include not only ways of thinking and acting but also academic qualifications, professional occupations, educational practices, research projects, prizes, journals and many other traditions. And, as a result of the institutionalisation of an academic subject, its characteristic skills and methods are generally more formalised than the abilities needed for a language-game. An academic subject is therefore not a language game. It would be more accurate to say that an academic subject consists of very many language-games, some of which are the same as those in other academic subjects and some of which are different.

Third, there is the more complicated matter of truth. Hirst seems to think that the truth criteria applied in a form of knowledge as an academic subject (or set of them) is a large part of what distinguishes it from another form of knowledge (or set of them), just as the truth criteria applied in a language-game are a large part of what distinguishes it from another language-game. Both the claim about academic subjects and the claim about language-games are muddled. Not all language-games are identifiable in terms of truth criteria quite simply because some language-games have got nothing to do with truth (e.g. the language-game of greeting a person or of issuing

an order). The whole point of Wittgenstein's wider philosophy in which the concept of a language-game features is to remind us that a great deal of language is not descriptive and not targeted at truth. Nor are all academic subjects identifiable in terms of truth criteria because many of them deal with the same type of truth (economics, physics, history and geography are all more or less concerned with empirical truth). Indeed, even if all academic subjects are concerned with some sort of truth (which not everyone would accept), it is not easy to decide how truth in relation to some academic subjects (e.g. English literary studies) should be analysed.¹⁰

This weaker claim than the one that Hirst made is correct: some language-games are distinguishable in terms of truth criteria. But Hirst would probably not have appreciated the full significance of it at the time of writing 'Liberal Education and the Nature of Knowledge', even if he had believed it. For he had an empiricist understanding of truth strongly influenced by A J Ayer whose *Language, Truth and Logic* Hirst was then reading. For example, as late as 1974, Hirst said that 'if one is to talk of logically distinct realms of meaning, one is in fact necessarily also talking about logically distinct types of truth criteria' (1974(a), 66), and he continued to associate 'truth criteria' and 'objective tests' with 'testable against experience' (1974(b), 88). In other words, one realm of meaning is distinguishable from another in terms of truth criteria. The truth criteria associated with a realm of meaning determine how a statement made in that realm is to be tested against experience. The implication is that there is no meaningful statement (in any realm of meaning) whose truth is not testable against experience. This is highly reminiscent of Ayer's logical positivism which claims that there are no significant (non-tautologous) propositions apart from empirical hypotheses (see Ayer, 1971, 56). So, for all of Hirst's pronouncements about different language-games having different truth criteria, his thinking tends to presuppose one

¹⁰ A more promising way to go here might be to distinguish sets of academic subjects, in the way that the natural sciences and the human sciences have been distinguished in terms of explanation (*Erklären*) and understanding (*Verstehen*) in German hermeneutics.

type of truth criteria, an empirical type. It would be more in line with Wittgenstein's philosophy, however, to say that, first, we speak of truth only in *some* language-games, and, second, when we do speak of it the truth we speak of is *not always* empirical. In the end Hirst's notion of a form of knowledge lacks coherence because at the heart of it lies a contradictory combination of Ayer's view of the relation between meaning and empirical truth and Wittgenstein's rejection of that view.¹¹

To be fair to Hirst, though, he did make a similar assessment of his earlier work in later years. He confesses that he had not realised that Wittgenstein 'was radically challenging [both] my claim that all understanding is at least fundamentally propositional in character' and 'my positivistic presuppositions about meaning and truth' (Hirst, 2010, 164 and 166). The word 'understanding' is well chosen here (as it was, ironically, in Hirst's early definition of a form of knowledge given in section 2), because Wittgenstein used the notion of a language-game to elucidate varieties not of propositional knowledge (as Hirst originally thought) but of understanding (which Wittgenstein did not think was necessarily dependent on propositional knowledge).¹²

4. Liberal Education and Understanding

So was Hirst wrong to look to the Greeks and to Wittgenstein to learn about liberal education? As I said, Hirst became critical of his 1965 paper. His thinking moved in a more social and practical and a less individualistic and theoretical direction. The concept of mind implicit in his later work did not give supreme importance to knowledge and it was more accommodating to the idea that skills

and emotions are relevant to education. To close, I want briefly to suggest that we do not have to follow that route. There is still something to be learned from the Greeks and from Wittgenstein about liberal education.

Hirst's ideas about forms of knowledge were sparked by Greek epistemology. '*Epistēmē*' in Greek literally means science. Its translation is often knowledge but it can also be understanding. Our culture has been so moulded by the scientific revolution and modern epistemology that it is difficult for us to hear the word '*knowledge*' without taking it to mean justified true belief of an *empirical* kind. An education that develops only a student's empirical knowledge would not be a liberal education. It might even encourage the epistemic vice of scientism. If, however, we translate '*epistēmē*' as understanding, Greek epistemology can serve as a foundation for a more coherent notion of liberal education. On this approach, a liberal education is one which helps a person lead a good life by freeing the mind through the development of forms of understanding.

But how is that different from the development of forms of knowledge? We can turn to Wittgenstein for an answer. Much of Wittgenstein's later work can be read as the utilisation of a distinction between understanding and knowledge - and closely related distinctions such as meaning and truth, nonsense and falsity, concepts and facts, the normative and the descriptive, and practice and reality. Knowledge is the acquisition of true beliefs. Understanding can be the acquisition of true beliefs, but often that is not the way to read it in Wittgenstein's philosophy. Rather, to develop a form of understanding is to develop a meaningful way of being, which is usually a way of making sense with language. We show that we have a form of understanding in this sense when we use some language correctly (artificial intelligence's lack of understanding can be explained by the fact that, despite its seeming to use language, it does not use it (correctly or incorrectly) at all). The more broadly and more deeply we can make sense of things the greater our understanding.

¹¹ The story of Wittgenstein's and Ayer's influence on Hirst given in Standish (2023) is very similar to mine.

¹² It has been reported that Rush Rhees, a friend, student and one of the literary executors of Wittgenstein, thought that 'Hirst would have been nearer the mark' when he analysed forms of knowledge as academic subjects, 'if he had spoken of forms of understanding, but this might have forced Hirst to give up the prominent role of proofs and tests in his account' (Lloyd, 2023, 210). I have tried to show that forms of understanding are much more suitable for making distinctions between language-games than between academic subjects.

But to make sense of something is not to hold a contingent empirical truth about it. For you must be able to make sense of something first before you can hold a contingent empirical truth about it. I cannot utter 'The cup in front of me is red' and intend to express a contingent empirical truth unless I already understand what the word 'cup' and 'red' and 'front'... mean. In short, knowledge requires, and is one application of, understanding.

An education based on the development of forms of understanding is more liberal and more freeing of the mind than one based on the acquisition of knowledge because our forms of understanding enable us to do more than merely acquire or convey knowledge. We can also express ourselves poetically, evaluate our lives, give vent to our feelings, and make logical deductions in a fictional space. So a good liberal education is one that develops a student's forms of understanding to the fullest extent. That can happen only if a student's linguistic capacities are developed to the fullest extent. That is not to say that students should learn as many foreign languages as possible (although that might help). It is to say that students should develop a highly discriminating consciousness, which they cannot do without language (i.e. unless they know at least one natural language). It is to say that they should develop a sensitivity whereby they are alive to the world in ways that less liberally educated individuals may not be and are capable of expressing their responses clearly and precisely and imaginatively. It means, in a word, becoming more articulate. But more articulate not simply in the arts and the human sciences but in the natural sciences as well. Of course, this is not all that we might take from the Greeks and from Wittgenstein when thinking about liberal education. Nor is it incompatible with a conception of liberal education derived from ideas about freedom of thought and expression from modern libertarians like John Stuart Mill. Parochialism - or narrow-mindedness - is opposed by both the Millian liberal educator and the educator imagined here. But they notice it in different places. While the Millian finds parochialism in various parts of public life, the Wittgensteinian sees it in intellectual life

in particular, especially in a type of theorising that ignores how mutable and heterogeneous ordinary language is.

References



Education for creativity: Enhancing teachers' capacity to foster and develop students' creative qualities in the context of formal education at UCS

By Adriane Martini

1. Introduction and context

This research is grounded on two pillars: 1- the broad, philosophical discussion about the principles for an education for the future and 2- a pragmatic, specific goal set by my school context that decided on the exploration of creativity in formal education as a way to counteract potential detrimental effects of Artificial Intelligence (AI) on schools and to prepare students for the work market they will face. “Creativity” became a general theme for the academic year as a school priority.

The main questions addressed were:

1. What is the definition of creativity in the context of formal education according to academic research?
2. What are the key features of a creativity framework, developed through collaboration with colleagues, for teachers to use in school?

The discourse on the quality of formal education frequently begins with the idea that the educational

system requires “radical improvements” (Ashton, 1996) or even a “radical transformation” akin to a revolution (Robinson, 2017). This might come from the fact that teaching happens as part of a broader contemporary context, and the one that teachers face today is possibly one of overwhelming complexity and accelerated change never experienced before. Robinson (2017) argues that it is impossible to keep up the rapid pace of transformation in society, driven by technological advancements like personal computers, the internet, and artificial intelligence. We struggle to define the knowledge and skills necessary to prepare students for an unpredictable future, often beyond our lifetimes, as we can barely understand the changes ourselves. Yet, educational frameworks continue to rely on outdated models, leaving both educators and students navigating an already evolved world, rather than actively shaping it (Freire, 1967). As educators, we often find ourselves trying to make sense of a changing world rather than participating in its creation, raising the question of how to develop an education system that prepares students for the future. In this scenario, creative qualities that allow individuals to remain adaptable, resilient and open to new possibilities, come up as essential qualities that should compose this education for the future (Lucas et al., 2013; Lucas & Spencer, 2017; Robinson, 2017).

This context would not be complete if we do not mention changes in society that go beyond technological advances. Topics such as

intersectionality, representation and decolonisation of the curriculum have taken place at the forefront of the current public debate. Creating spaces where diversity not only coexists but also has a voice in shaping ideas in education became an ethical commitment for anyone in tune with this transformation.

By asking, “What principles in teacher education can guide us in an unpredictable future?” I aimed to identify principles that resonate with contemporary challenges and that justified the need to discuss creativity as an important element to be encouraged and developed in young people. This is because, based on the reflections from this research, I believe that proposing a development in education should not be grounded exclusively on preparing our students for the work market, but rather by a holistic view of how we want to develop fulfilled, healthy and happy human beings.

From the classic work of Freire (1967), I deduced the principles that supported the importance of embedding creative qualities in formal education. Education for freedom is perhaps the most important idea in his work. Education should ultimately empower individuals to exercise their freedom and agency, actively contributing to the creation of a more democratic and inclusive society. For this to happen, knowledge must be co-constructed through active engagement, with both educators and learners participating in a non-hierarchical dialogue. Since this is a potentially changed world where we have much more access to a diversity of voices and needs, learning must be contextualised, rooted in the learners’ social, cultural, and historical backgrounds, to ensure that it is relevant and meaningful to their lives too. Education should foster continuous reflection on personal experiences and the world, always encouraging critical thinking. This educational process should lead to transformative praxis, where learners apply their critical insights to address wider issues. Finally, education should be guided by ethical engagement, prioritising social justice and the well-being of all. It should cultivate

empathy, respect, and a sense of responsibility towards others.

This pedagogy seeks to empower learners by fostering a participatory and democratic classroom environment, where education is a process of co-creation and liberation of minds (as opposed to the learning of standardised content). It encourages teachers and learners to critically analyse their social context, question assumptions, and to become aware of the power dynamics that shape society. Creativity is, therefore, an essential element of human agency and transformation, not merely an artistic endeavour but a means of fostering active participation, critical consciousness, and transformation within both the individual and society.

2. Literature Review

2.1 Defining creativity

“(...) imagination, which is the process of bringing to mind things that are not present in our senses; creativity, which is the process of developing original ideas that have value; and innovation, which is the process of putting new ideas into practice.” (Robinson, 2017, p.2)

Defining creativity is challenging, as the concept is composed of a complex and dynamic combination of factors that can include individual, cultural, and historical considerations. Perceptions of creativity have shifted over time (Hernández-Torrano & Ibrayeva, 2020; Mumford, 2003), shaped by historical contexts and attitudes towards creative characteristics. Therefore, defining the concept of creativity seems an important task as, like many broad concepts, its understanding is often affected by subject specific factors (Mumford, 2003). However, creating a common language about what it means to be creative is an essential step to make the discussion about embedding opportunities for its development in schools possible (Lucas, Spencer, et al., 2013a). This does not mean negating the existence of

multiple theoretical perspectives and different assumptions that provide a robust understanding of human creativity (in what Kozbelt et al. (2010) have called 'pluralism' (p.2)) but rather understanding that this concept might remain dynamic and open.

For this research, the definition of what creativity means will always be in the context of education. This is not a limiting decision, since creativity and learning have frequently been closely linked. For example, Guilford (1950) suggests that “a creative act is an instance of learning” (p.446).

The most accepted recent definition of creativity includes two core characteristics: 'originality and usefulness'. Originality refers to objects or actions that are novel, unique and infrequent, while usefulness must be appropriated, fit for purpose, valuable to the context where it happens (Hernández-Torrano & Ibrayeva, 2020; Mumford, 2003; Vincent-Lancrin et al., 2019). This separates pure imagination from creativity, as imagination does not necessarily contain usefulness. Additionally, it includes creativity as a step towards innovation, or when the original ideas that have value would become reality and contribute to changing the world (Robinson, 2017).

2.2 Connecting research and practice

Mullet et al. (2016) conducted a systematic review and thematic analysis of literature from 1999 to 2015 looking to establish whether teachers' ideas about creativity are accurate, suggesting this as the condition to enable better practices in the classroom. They concluded:

“(...) although teachers value creativity, their conceptions of creativity are uninformed by theory and research on creativity. Teachers feel unprepared to foster or identify creativity in their classrooms; they equate creativity with the arts; and personal and cultural beliefs affect their perceptions of creativity and creative students” (p.9)

The ability to define and recognise creativity is crucial for teachers in fostering creativity in students through curriculum and pedagogy. If teachers' conceptions of creativity were found to be often limited, vague, or confused, this indicates a need for a clearer understanding of the creative personality, process, products, and environmental factors that promote creativity. These key findings showing the inconsistent connection between beliefs (in this case, around creativity) and practice (or educating for creativity) suggests that what is being revealed in research is not always being translated into enhanced classroom practices.

Education has witnessed a significant shift towards research-informed practices in recent decades (Korthagen et al., 2006). However, establishing effective links between research and practice remains challenging (Bullough, 1997; Crowe & Berry, 2007; Korthagen et al., 2006). This challenge arises from the distinct nature of research and the dynamic, high-pressure realm of teaching, where academic research, often abstract or based on established practices, struggles to keep pace with reality. The reductionist nature of research further limits its ability to reflect the diverse, holistic realities of education (Cochran et al., 1993; Rowland et al., 2005; Shulman, 1987).

An aspect that receives less attention pertains to the broader contemporary context that teachers face. Robinson (2017) demonstrates the increasing difficulty for teachers to keep up with the pace of changes in society, a challenge accentuated in recent decades by technological developments. The dazzling pace we currently produce and access new information, as well as the technological advances and societal changes are, undoubtedly, affecting what education should be like. Teachers are expected to, somehow, keep up with the sophisticated developments in cognitive neuroscience and all it has contributed to understanding how people learn, including the explosion of theories such as metacognition, dual coding and cognitive load (Howard-Jones, 2014). Parallel to that, schools are facing mounting

pressures to cope with an unprecedented mental health crisis among young people, not to mention the need to adapt to emerging narratives around intersectionality, representation and decolonisation of ideas. Add to that the promised revolution (or threat) Artificial Intelligence (AI) poses in the contemporary educational context (Selwyn, 2019).

It is no surprise that teachers remain sceptical about the benefits of engaging with the slow pace of academic research. Since the present research is partially motivated by the current context with the fast pace of technological innovation, I explored alternatives of connecting research and practice. The educational intervention proposed here needed to allow for flexibility on how teachers use the strategy and it had to allow for a holistic development of students (Freire, 1967).

A framework incorporating the core characteristics of creativity based on academic research and summarised clearly enough for teachers of any level of experience seemed like a potential strategy. The framework would have to also present how these characteristics could be developed in the context of formal education, in the context where this research was developed and in line with the contributions teachers already give in their day-to-day practices. Finally, the work would have to be conducted in collaboration with experienced colleagues that hold a deep knowledge of educational practices and a healthy interest in academic research. Such a framework would, of course, need to be based on a model of creativity that was appropriate to the classroom context.

2.3 Model of creativity

The goal of this research was to find models of teaching creativity that would easily lend themselves to the context of teaching. Models of creativity mean “well-developed systems of statements, based on a specific theory of creativity and concerning strategies and methods of teaching creative thinking and action, conditions of education, the role of a teacher in that process, and evaluation of education results” (Szmidt & Majewska-Owczarek, 2020, p.54).

A positive step towards connecting creativity in education to concrete pedagogical choices can be found in the move by the Programme for International Student Assessment (PISA), that introduced a new test of creative thinking alongside the usual tests for 15-year-olds in English, Maths and Science (Schleicher & Belfali, 2022). As the PISA test functions as a global comparative education standard via systematic means, looking at the literature supporting the change in the test could provide the clues to what is needed for a curriculum that can foster creativity.

A great part of PISA's work was informed by the *Five Creative Dispositions Model* (Lucas et al. 2013), that delineates five key characteristics that foster creative thinking and behaviour: Inquisitive, Persistent, Imaginative, Collaborative, and Disciplined (picture 1). This model is based on extensive research and tested in real school contexts. By providing description of each disposition, as well as examples of how they could be encouraged in the classroom, Lucas et al. (2013) provide a framework that can be easily adapted to a variety of educational contexts and subjects.

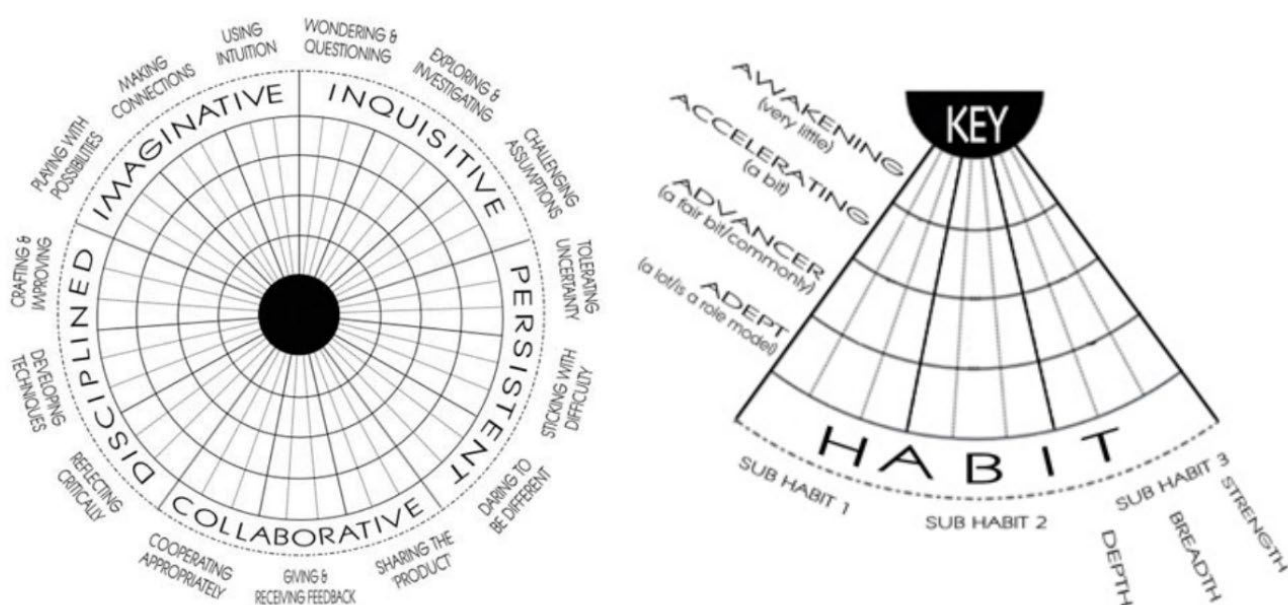
How are the dispositions defined? In summary, the Inquisitive disposition involves a strong desire to know and learn, characterised by curiosity, questioning, and exploring new ideas and experiences. This proactive approach to seeking knowledge often leads to new insights and solutions. The Persistent disposition emphasises determination, resilience, and diligence, highlighting the importance of dedication and perseverance in overcoming obstacles and refining ideas. The Imaginative disposition is key for generating original and innovative ideas, involving visioning, playful exploration, and dreaming beyond conventional boundaries. The Collaborative disposition proposes the focus on teamwork and collective intelligence, enhancing the creative process through cooperation, empathy, and networking, benefiting from diverse perspectives and shared efforts. Finally,

the Disciplined disposition ensures that creative ideas are well-developed and executed, balancing creativity with structure and precision through reflecting, crafting, and consistent practice.

These dispositions show that creativity involves not just the generation of ideas but persisting, imagining, collaborating, and refining them. It also suggests that these characteristics can be developed independently and in line with the subject or context where they are being taught. For example, collaboration might be better suited to discussions, whereas discipline might be better suited to later stages of writing an essay or refining coursework in visual arts.

In fact, a strength of this model is that it functions simultaneously as a development and assessment tool for teachers to create opportunities for creativity in their usual curriculum. For example, the circular model contains four layers representing the level of expertise displayed by the learner for each creative disposition. From the centre to the outer layer, they are organised

as: the lowest level – “awakening” – followed by the stages “accelerating”, “advancer”, “adept” (Lucas et al., 2013, p.18). When teachers express that one of the main pressures they have for developing creativity in formal education are the pressures of formal assessments and the need to demonstrate progress (Mullet et al., 2016), this tool can potentially solve a significant barrier to developing their pedagogical choices. In fact, the OECD report’s recommendations include the importance of “incorporating the tool into the school’s data collection, reporting, and reward systems” for creativity to be taken seriously (Lucas et al., 2013, p.27). It is evident that the focus of their work is the idea that teachers need practical tools to be used in their day-to-day roles, as well as to reinforce the belief that creativity can be learned and can be developed in any subject of the school curriculum.



Picture 1: The five creative dispositions created by Lucas et al. (2013)

3. Development of the model to UCS

Research question 1: What is creativity in the context of formal education according to academic research?

This question was largely answered in the literature review section. For clarity's sake, I will present a very summarised version of the main ideas that seemed to represent what was essential to the concept of creativity in education and that revealed themselves as being the most useful concepts for the development of the creativity framework later in the project.

Robinson's (2017) definition of creativity in a spectrum between imagination and innovation was a key finding in the literature review as it connects this project to the reasons why the school that served as a context to this research wanted me to focus on this theme in the first place. This is, the current debate around the potential detrimental effects AI can have in formal education and in the future of students who are experiencing a traditional format of education and will enter an unpredictable work market in a few years' time. The suggestion that creativity is a step towards innovation puts creative qualities as desirable characteristics to be developed in education if we want our students to become competent individuals in a world marked by technological development.

A second strength of this definition is that it describes creativity in line with most of the literature reviewed, meaning it incorporates the two core qualities widely agreed upon by other researchers: "(...) **creativity, which is the process of developing original ideas that have value**" (Robinson, 2017, p.2). Both novel and useful are the most frequently cited characteristics in any literature review used in this research (Hernández-Torrano & Ibrayeva, 2020; Lucas, Spencer, et al., 2013b; Mumford, 2003; Treffinger et al., 2002). Therefore, Robinson's (2017) definition became very useful in conveying two core ideas in this

project: its suitability to the context where it was developed and its agreement with academic research in the field.

A second key finding from literature in relation to the concept of creativity was the "**Five creative dispositions model**" (Lucas et al., 2013). This is because it clearly states the core characteristics most frequently associated with creativity according to research and it connects them to the context of education, including possibilities for the development and assessment of creativity: imaginative, persistent, inquisitive, collaborative and disciplined. This is in stark contrast with earlier attempts to define creativity that, though very thorough, were not very practical or intended to be used by practitioners. For example, see Treffinger et al.'s (2002) account of 120 distinct definitions for the term. By breaking creativity down into five comprehensive qualities and using a vocabulary that is accessible to most people, the model offers a great starting point to direct the work that would be shared with colleagues at a later stage. It is only fair that a framework for the development of creativity also contained the qualities of being both novel to the teachers and useful in their practices.

Research question 2: What are the key features of a creativity framework, developed through collaboration with colleagues, for teachers to use in school?

The final framework is presented below (picture 2).





Picture 2: The creativity framework created collaboratively with colleagues and inspired by literature

4. Conclusions and implications

The concept of creativity in the context of formal education was largely answered by the literature review, notably by Robinson's (2017) definition (cited in the literature review) that sees creativity in a spectrum between imagination and innovation, with the qualities of being both original and useful. The appeal of this definition is that it fosters the concept of innovation, a factor that is identified in literature as deeply affecting education and the future of our students and one that is closely connected to the concerns of my educational context (specifically, about the use and impacts of AI).

As the academic definition of creativity is not always translatable to classroom practice, I researched for guidance on creativity applied to the context of education. Lucas et al. (2013)'s model for creativity, in dialogue with the OECD (2023) report, provided interesting possibilities well suited to UCS. Any work I develop in this context needs to observe the liberal ethos of education, but also to be in line with the best pedagogical practice available measurable by standardised tests. The PISA test standards shown in the OECD report would be a suitable measure for that. As a teacher educator, this research showed me that matching the exploration of pedagogical interventions to my specific context is an essential step to ensuring my research is approved by senior management. Showing the relevance of creativity for an education for the future and supporting this with expert literature allowed me to do that.

In fact, incorporating a discussion on what creativity looks like in every-day education was something prompted by the answers gathered by the initial survey about teachers' beliefs about creativity¹. Showing teachers that creativity can be expressed and developed in everyday classroom activities they already utilise could address any anxiety that they are not sufficiently creative individuals themselves

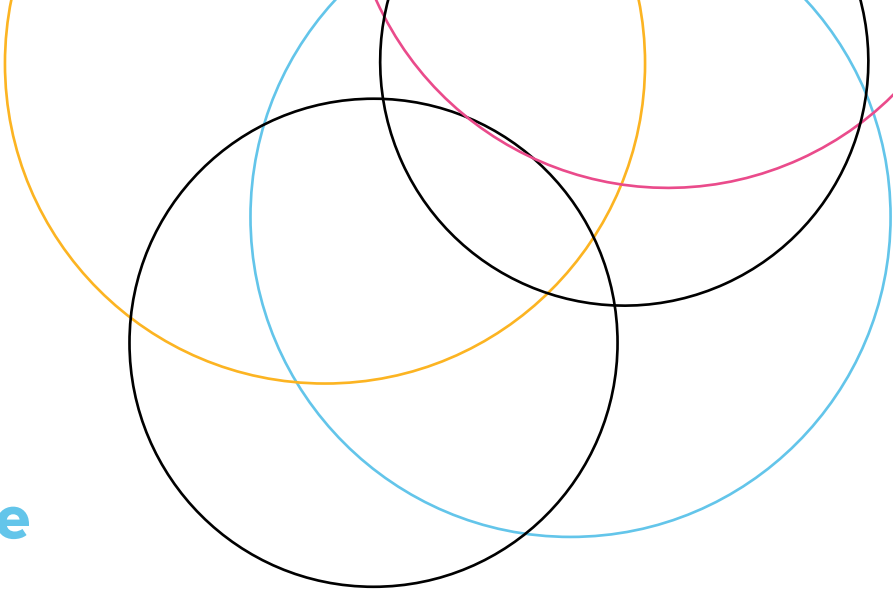
¹ The data was removed from the present text and it is available in the full, original text if members of staff wish to consult it.

in the first place. For example, most teachers are capable of developing critical thinking and using metacognitive strategies as part of their pedagogical choices, both activities connected to the development of creative qualities according to Lucas et al. 's (2013) model.

'The five creative dispositions' stood out as the most appropriate and relatable model. It is also a model that inspired the OECD's (2023) rubrics and the introduction of creativity as an assessed skill in the PISA test. Having support from such a prestigious institution that utilises standardised measures for education was somewhat important to ensure the credibility and relevance of this work to the school where this will be introduced. The question associated with that was about the essential features of the creativity framework produced to guide teachers in embedding opportunities for creativity in their every-day practice. Here, working in collaboration with colleagues who could bring different perspectives, areas and levels of expertise, was not only a positive approach, but also in line with the principles in education proposed as the ethos justifying this project.

"Mutual support among the group of early catalysts, affectively and cognitively, was critical in keeping the initiative going on. Leadership and peer support were important conditions for teachers leading professional learning. The article advances understanding of the process of teacher collaboration to implement an initiative in a small group prior to spreading the initiative to the entire school" (p.650).

References



Language-responsive teaching: Improving EAL students' understanding of 3D solids in Mathematics

By Cecilia Zhu

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1. Introduction

In recent decades, linguistic diversity has posed significant challenges for both teachers and students in Mathematics Education (Sharma & Sharma, 2022). According to Barwell (2009), a considerable number of school students in England face the dual challenge of learning both mathematics and the language used in the classroom for teaching mathematics. Schleppegrell (2011) also highlighted various difficulties that EAL (English as an additional language) students in English-medium classrooms encounter, such as reading, misinterpretation and communication, as they have to learn both everyday English and mathematical English whilst distinguishing between the two.

As a Maths teacher, I have observed that most of EAL students in a Year 10 class face various challenges when learning mathematics, such as understanding Maths questions with complex sentence structures, solving word problems, and differentiating mathematical terminologies. Particularly, when tasked with 3D (three-dimensional) geometry, I discovered students

struggled with specific mathematical terms, the imagination of 3D solids, the real-life application of surface and volume, etc. Various research has shown that students commonly encounter difficulties in learning 3D geometry (e.g., Widada et al., 2021; Wright & Smith, 2017), such as misunderstanding the definition of a uniform cross-section in a prism. The EAL students in my classes seem to face even more challenges due to language-related difficulties, which amplifies those common misconceptions.

This paper explores inclusive, language-responsive teaching strategies to support EAL students' understanding of 3D geometry. Informed by relevant literature, a lesson on prism volume was designed, integrating digital technology, word problems, real-life scenarios, and hands-on activities to promote mathematical learning.

2. Literature review

2.1 Challenges in Mathematical learning for EAL students

2.1.1 Mathematics Register

Mathematics has a particular way to express ideas with its own vocabulary, conventions of usage and presentation, which is known as the “**Mathematics Register**” (Halliday, 1979). Halliday (1979) stated that the ‘mathematics register’ is the mathematical use of natural languages,

such as “odd”, “even”, “translation”, “reflect”, etc. As mastering Mathematics registers and effectively switching between them requires proficient linguistic skills, many students might feel challenged in understanding and reasoning the complex cognitive level of mathematical discourse (Schleppegrell, 2011).

According to Barwell (2009), EAL students may need additional time to understand Mathematics registers in English-medium classrooms compared to native English speakers. For example (**Figure 1**), several EAL students struggled with the phrase ‘write down the value of,’ confusing it with naming angles rather than providing measurements.

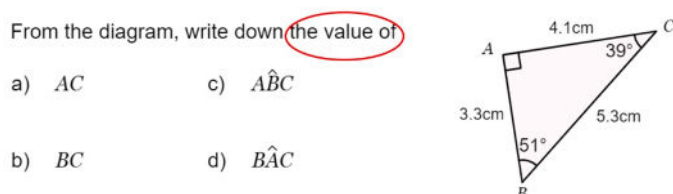


Figure 1 A confusing question to my EAL pupils.

However, this particular challenge appeared to be less prevalent among native English speakers in my class. Most of them quickly and accurately recorded the appropriate length or degree in response to the question. One native English-speaking student explained that she was already familiar with the phrase “the value of something” and understood that the question required her to provide a number. This highlights the importance of considering linguistic factors when supporting all students in an inclusive environment (Barwell, 2009).

2.1.2 Reading Mathematics

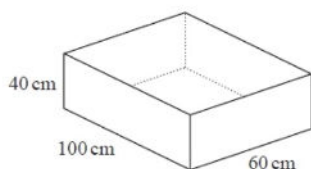
Mathematical contents can provide learners with extra difficulties while reading English as learners have to simultaneously understand and process information in languages of both English and Mathematics (Jourdain & Sharma, 2016). Although researchers cannot definitively confirm that students’ English proficiency directly impacts their ability to read Mathematics, various studies suggest that a lack of fluency in English

literacy may indeed hinder their understanding of mathematical texts (e.g., Neville-Barton & Barton, 2005; Barwell, 2009; Trakulphadetkrai et al., 2020).

Neville-Barton and Barton’s (2005) study examined Mandarin-speaking students in New Zealand schools. They administered Mandarin version tests to half of the students and English version tests to the other half. The results revealed that 15% of them faced challenges in the English version tests owing to difficulties with prepositions, word order, and contextual interpretations. These results align with Barwell’s (2009) argument that EAL learners face additional obstacles when solving word problems compared to native speakers because EAL learners not only need to decode words but also learn to read between the lines and grasp the underlying mathematical knowledge.

2.1.3 Contextual problems

Contextual problems in mathematics often incorporate mathematical language that extends beyond Mathematics registers, such as cultural contexts, complex sentence structures, graphic representations and symbols (Jourdain & Sharma, 2016). Barwell (2009) highlighted that learners from minority cultural or linguistic backgrounds might struggle with contextual problems because of their unfamiliarity with certain words. For example, during a lesson with my Year 10 students, they were given a contextual problem involving filling a cuboid sand pit with sand by using sandbags with 8 litres of sand in each (**Figure 2**). Some of the EAL students did not know the concept of a sand pit, which led to confusion and lengthy discussions. Also, they struggled to understand the relationship between litres and cubic centimetres, which hindered their ability to connect the context to the volume of the cuboid. The complexities of the English Mathematical language seem to distract their focus from the underlying mathematical knowledge (Jourdain & Sharma, 2016).



Sally wants to fill the sand pit with sand.
A bag of sand costs £2.50
There are 8 litres of sand in each bag.

Sally

"The sand will cost less than £70"

Show that Sally is wrong.

Figure 2 A contextual problem

2.2 Effective strategies for supporting EAL students in Mathematics learning

According to Pimm (1987), teachers play a crucial role as intermediaries and mediators between students and mathematics. They not only establish the patterns of communication in the classroom but also serve as “**native speakers**” of mathematics. Up to now, various studies have proposed effective strategies that teachers can employ to address the language challenges discussed in the previous section, involving digital technology, hands-on aids, peer discussions, etc. (e.g., Jourdain & Sharma, 2016; Sáenz-Ludlow & Presmeg, 2006; Solomon & Black, 2008, etc.).

2.2.1 Visual strategies

Visual strategies appear to be beneficial in assisting EAL students with a disparity between their mathematical ability and language skills, as visualisation enhances the connection between graphical representations and formal definitions (see Nguyen & Cortes, 2013; Widada et al., 2021). This paper utilised two main strategies for utilising visualisation in supporting EAL students’ understanding of 3D solids in Mathematics:

1. Teachers’ demonstration with the use of digital technology.

Since geometric concepts and terms can be abstract and challenging for EAL learners, teachers’ visual demonstrations might help contextualise mathematics (Jourdain & Sharma, 2016). Dynamic visual representations and 3D animations on the screen might support EAL students in

developing 3D thinking and reasoning skills (Widada et al., 2021). For instance, teachers may use an animation to demonstrate the process of filling a cuboid container with water to explain the concept of “1 litre = 1000 cubic centimetres”.

However, to effectively enhance the understanding of specific Mathematics registers among EAL students, teachers are suggested to be mindful of their guidance and spoken language when explaining visualised objects (Sáenz-Ludlow & Presmeg, 2006). As mentioned in section 2.1.1, EAL students may struggle with certain Mathematics registers (Schleppegrell, 2011), such as “cross-section” and “prism”. Therefore, aside from demonstrating the animations on the screen, such as moving cross-sections in prisms, teachers are suggested to provide clear and accessible explanations of the demonstration (ibid.), such as modelling the formal definition of a cross-section. According to Solomon & Black (2008), teachers’ spoken language tends to dominate in Maths classes since it is an effective means to interpret the meanings conveyed by visual representations.

2. Students’ manipulation of physical items.

Aside from digital animations, physical items might also assist EAL students in understanding mathematical objects and contents (Nguyen & Cortes, 2013). Using manipulatives might help reduce the language load of mathematics for EAL students, as students can learn through seeing and physically manipulating resources (ibid.).

Furthermore, by self-exploring the physical objects, EAL students can work out answers independently, even if they might not be confident enough to pose questions in English or approach teachers (Nguyen & Cortes, 2013). For instance, I provided real-life prism-shaped packaging at the

beginning of my designed lesson, as shown in **Figure 3**, motivating students to self-explore the similarities among these items and foster an initial impression of prisms.



Figure 3 Prism-shaped food packaging

2.2.2 Hands-on activities

Mathematical hands-on activities refer to learning experiences involving physical manipulation and interaction with concrete materials to investigate mathematical concepts (Raviv, 2004). During hands-on activities, students are often provided with manipulatives or tools, such as cards, scissors, papers, colourful pens, etc., to engage with mathematical tasks (ibid.). A classic example of hands-on activities designed to support EAL students is card games (Jourdain & Sharma, 2016), where students need to match up cards with four sets of equivalent geometry concepts. To further enhance their learning experience, students might create their own set of cards for new Mathematical terminologies and symbols they have learned, adding an element of creativity to the activity. According to Sáenz-Ludlow and Presmeg (2006), hands-on activities offer valuable opportunities for EAL students to engage in communication with their peers and teachers, enabling them to express their mathematical ideas by using formal mathematical language.

Additionally, teachers can enhance these activities by incorporating elements of EAL students' cultures and stories, thus acknowledging and valuing their cultural resources (Barwell, 2009). Therefore, I incorporated a hands-on activity into my lesson plan. Each student was provided with a paper to create a cuboid box capable of holding an item representing their own cultures, such as traditional cuisines, tea leaves or

cultural handcrafts. By integrating their cultural backgrounds into the activity, EAL students were allowed to share their cultures and experiences, making the problem more relatable and engaging for them (Barwell, 2009).

2.2.3 Solving contextual problems

As discussed in section **2.3.1**, contextual problems often involve both Mathematics registers (Halliday, 1979) and English mathematical context (Jourdain & Sharma, 2016). Engaging in the practice of solving these problems might assist EAL students in mastering mathematical knowledge while developing their language proficiency (Jourdain & Sharma, 2016). However, the role of teachers seems to be crucial in guiding students through these problems to effectively support their understanding of underlying mathematical concepts within the context (see Sáenz-Ludlow & Presmeg, 2006; Solomon & Black, 2008; Pimm, 1987). In alignment with previous studies, this paper summarised four suggestions provided for teachers to better support EAL students in developing both language and mathematical skills while solving contextual problems:

- Explain Mathematics registers (Halliday, 1979) by providing explicit instruction and examples (Solomon & Black, 2008).
- Scaffold and model language by breaking down complex mathematical concepts into manageable chunks and providing visual aids and simplified explanations (Solomon & Black, 2008).
- Encourage peer discussion and collaboration to create a supportive environment where students can learn from each other (Sáenz-Ludlow & Presmeg, 2006).
- Critically review students' practice and provide feedback that helps EAL students self-correct their vocabulary, grammar, and syntax usage (Pimm, 1987).

3. The lesson

3.1 Research-informed lesson outlines

Since the students have already learned the formula for calculating the volume of cuboids, I planned to generalise this formula to all prisms. Therefore, the lesson began with introducing the concept of a cross-section through visual aids. After that, I guided students to solve a real-life contextual problem which aimed to support EAL students' reading Mathematics ability and cultural integration by applying the knowledge of prisms to a practical scenario (Schlepppegrell, 2011). Lastly, they were engaged in a hands-on activity as discussed in section 2.2.2.

3.1.1 Lesson objectives

1. Understand and use appropriate Mathematical language to describe prisms, including Mathematics registers such as “solids”, “prisms”, “cross-sections”, “base”, “layer”, etc.
2. Calculate the volume of prisms using the appropriate formulas, demonstrating mastery of the concept of volume.
3. Solve contextual problems related to volume, demonstrating the ability to read mathematics in real-life scenarios.

3.1.2 Lesson Design

In line with the suggestions of Nguyen and Cortes (2013) regarding the use of physical manipulations, I provided real-life prism-shaped physical items for students to observe and investigate their similarities and differences.



Figure 3 Prism-shaped food packaging

After that, I demonstrated multiple types of prism diagrams on the board and asked students to observe and define prisms. This allowed students to practise expressing their thoughts clearly and coherently in written form, as suggested by Sharma and Sharma (2022).

Next, corresponding to the visual strategies discussed by Jourdain and Sharma (2016), I dynamically manipulated the cross-sections of different prisms on the screen (see **Figure 4**) and highlighted the property that the cross-section remains the same throughout each prism. To assess students' learning, I posed a question on the board asking them to choose which item is not a prism and write down their reasons, which aimed to practise EAL pupils' writing skills while justifying their answers (Sharma & Sharma, 2022). With these preparations, I prompted students to recap the formula for the volume of a cuboid and then generalise “the area of the base” to “the area of the cross-section” by visualising the layers of prisms.

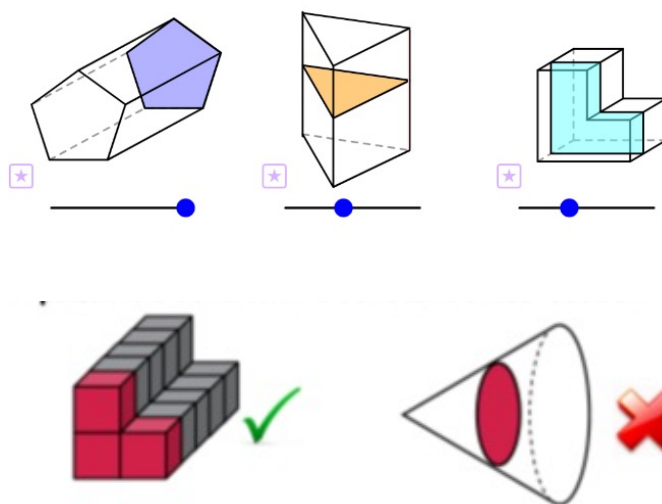


Figure 4 Dynamically visualise the concept of cross-section

Students were then shown an animation demonstrating the process of perfectly fitting cubes into a large cuboid box (**Figure 8**). This animation supported EAL students to

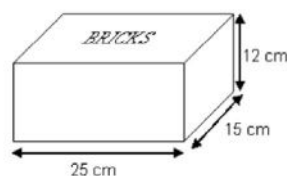
develop geometric reasoning by visualising the process (Jourdain & Sharma, 2016). With the spatial concept in mind, students were then tasked with solving the real-life question by reading the context, interpreting geometric diagrams and using appropriate mathematical language to express their solutions, refer to **Figure 7**.

A company makes building bricks for children.
The bricks are all 5 cm cubes.

The bricks are going to be packed in boxes.

John designs a box for the bricks.
The box is a cuboid.

The size of the box is 25 cm by 15 cm by 12 cm.



Will the box be big enough for 36 bricks?
You must give reasons for your answer.

Figure 7 Real-life fitting problem

The end of the lesson included an engaging activity where students were tasked with creating a cuboid box with the maximum possible volume by a $30\text{ cm} \times 30\text{ cm}$ square of paper. Students were told that they need to put an item representing their own culture into the cuboid box they made. Following the suggestions of Sáenz-Ludlow and Presmeg (2006), students were required to share their ideas of putting cultural items in their hand-made cuboid box with appropriate English and mathematical language, which served the dual purpose of practising their English language proficiency.

3.2 Observations and Analysis

3.2.1 Visual aids

Although students were engaged in the activity of observing and manipulating the prism-shaped food packaging, as shown in **Figure 3**, they appeared to be confused about describing the similarities between them with proper mathematical language. When they were shown prisms on the board (see **Figure 5**), five students wrote that “*the prisms are all very long.*” I asked one of the students what he meant by “*long,*” and he replied, “*The base*

extends long.” I then guided him to use the term “*cross-section*” instead of “*base*” and explained that if the prism-shaped box was cut straight down, each cut would be the same.

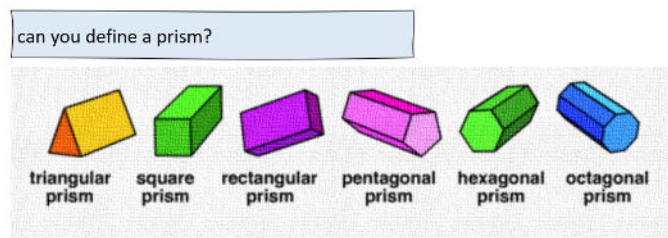


Figure 5 Define a prism.

However, most students still struggled to generate full sentences to describe the common property and instead wrote single words on their mini whiteboards, such as “*long,*” “*same cut section,*” or “*same base.*” This may be due to research by Barwell (2009) suggesting that understanding and applying mathematical registers can be more challenging for EAL learners compared to native speakers, owing to their limited linguistic proficiency.

Thus, to better support EAL students in comprehending the concept of cross-section, I utilised digital visual aids to dynamically demonstrate the movement of the cross-section in different prisms, as shown in **Figure 4**. Students focused their attention on observing the movement of cross-sections in each prism, and some of them became excited upon discovering that “*the shape stays the same!*” Thus, I was able to expose the property by complimenting their thoughts, “*Perfect! So, we know that the cross-section always stays the same in a prism.*”

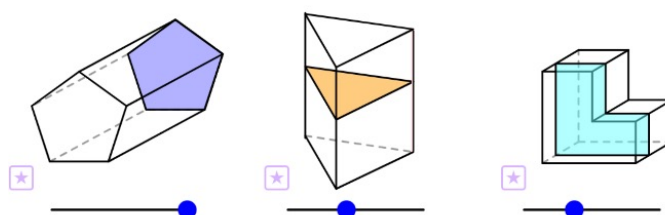


Figure 4 Dynamically visualise the concept of cross-section

This finding highlights the advantages of using dynamic animation to motivate students and enhance their visualisation of mathematical properties (Widada et al., 2021). Aside from this, as teachers' guidance and spoken languages seem to be important when demonstrating visualised objects (Sáenz-Ludlow & Presmeg, 2006), I then modelled the definition of a prism using formal mathematical language (Solomon & Black, 2008). Students took notes and repeated my modelling, *"Prism is a 3D solid with a constant cross-section."*

Which is the odd one out and why?

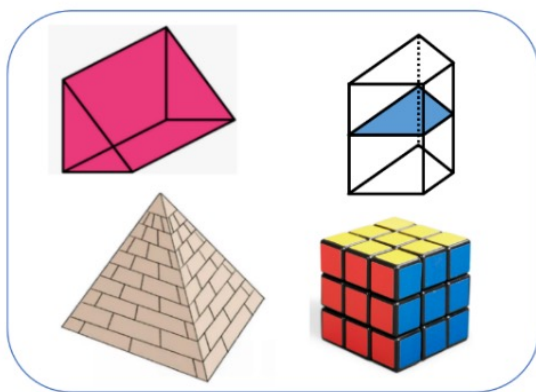


Figure 6 Assessment for learning question

Based on my assessment question for learning (**Figure 6**), all students correctly chose the pyramid as the odd one out. However, there were still some language-related challenges that emerged during the process. When asked to justify their answers, a few students struggled to write complete sentences to explain their reasoning. For example, student A wrote, *"The third one is odd, because it is not a prism."* Then, I asked him to name the third solid and explain why it is not a prism, he did not understand the meaning of "solid" and was also unfamiliar with the term "pyramid." He eventually said,

"I think it is odd because it has a sharp top instead of a flat base."

Student B appeared to understand why the pyramid is not considered a prism, as he

mentioned, *"Because the cross-section is not the same."* However, this statement exemplified his struggle to transfer his mathematical understanding to a more sophisticated level of mathematical discourse due to linguistic challenges (Schleppegrell, 2011).

3.2.2 A real-life problem

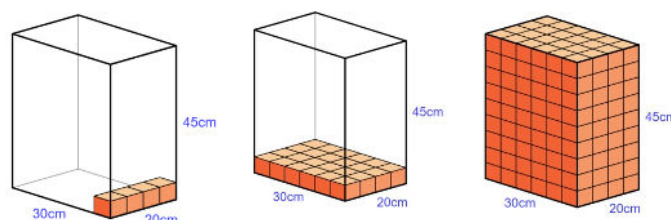


Figure 8 Initial demonstration: perfectly fitting.

After exploring the animation of perfectly fitting small boxes to a larger cuboid-shaped container (see **Figure 8**), the students appeared to initially grasp the nature of 'fitting' problems as they all attempted to calculate the volume of cuboids and cubes to solve the following real-life fitting problem (refer to **Figure 7**), *"A company makes building bricks for children. The bricks are all cubes. The bricks are going to be packed in boxes. John designed a cuboid box for bricks. Will the box be big enough for 36 bricks?"*

I was glad that most students correctly understood the nature of the problem as one of 'fitting' a given volume into another and carried out a correct calculation for that specific question; however, many students failed to consider the physical properties of the bricks themselves. Eight students misunderstood that the 36 bricks could perfectly fit into the cuboid-shaped box because they divided the volume of the box by the volume of the bricks and got the answer 36, i.e. $\frac{12 \times 15 \times 25}{5 \times 5 \times 5} = 36$ (e.g., **Figure 9**).

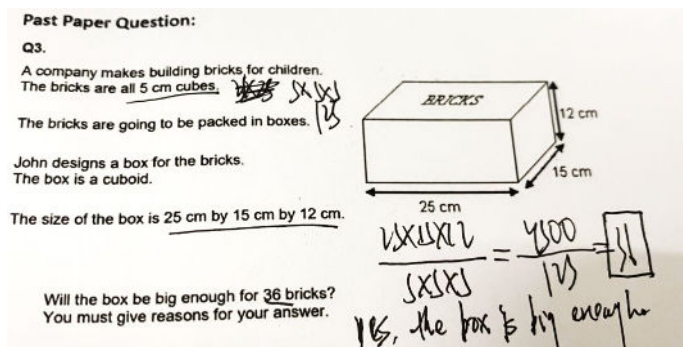


Figure 9 Students' common mistake

They overlooked the fact that bricks are solid objects that cannot be broken or divided like sand or water. I acknowledged that this misconception may be common among both native speakers and EAL learners, whereas the lack of familiarity with certain vocabulary may be more noticeable among EAL students (Jourdain & Sharma, 2016).

Followed by Solomon and Black's suggestion (2008), I guided students to think about the difference between sand and bricks: *"If we were to replace the bricks with sand, your calculation would be correct. Do you know why?"*

Student B had a realisation, stating, *"Oh, we cannot divide the volume because it is not sand or water; it cannot flow."*

However, Student C argued that *"But in the animation example, Miss divided the entire volume by 12"*

Another student inquired, *"So, what exactly is a brick?"*

As some EAL students were unfamiliar with the term "bricks", they began a lengthy discussion about what they were and how to fit them into the box. According to Barwell (2009), learners from different linguistic backgrounds may encounter extra difficulties when faced with contextual problems involving unfamiliar vocabulary.

To further support EAL learners, I provided visual aid (Nguyen & Cortes, 2013), showing them pictures of bricks and using an animation (see **Figure 10**) to demonstrate that there would be empty space when bricks were arranged in the box. Subsequently, the pupils realised that only two layers of bricks with a side length of 12cm could fit into the box with a height of 12cm.

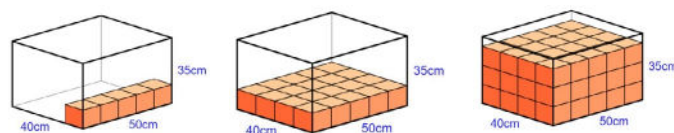
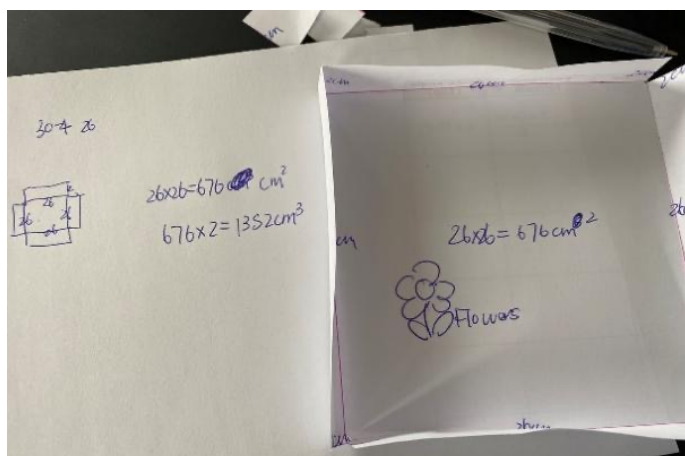


Figure 10 Fitting cubes into a cuboid box

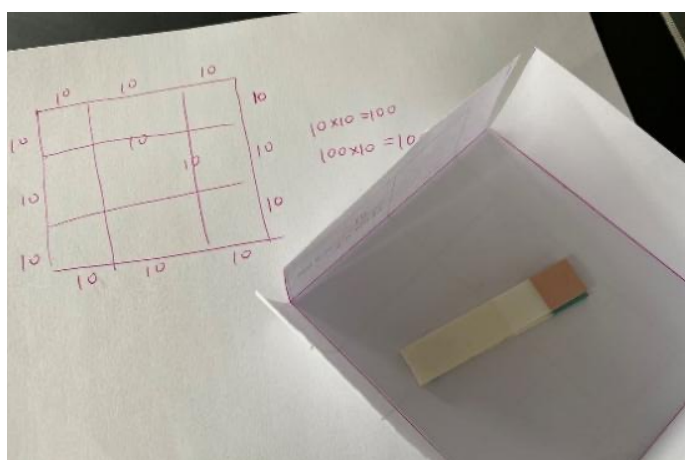
3.2.3 Hands-on activity: make your own cuboid box.

In this activity, all students were actively engaged and eagerly participated, using their hands to trim, fold, and create boxes, as evident in **Figure 11**. Working in pairs, they experimented with different box sizes and critically thought about the relationship between the side length and volume. Some EAL students even attempted to use written language to label their boxes and justify their answers. For instance, students E and F marked the side length of each side and correctly calculated the volume of their hand-made boxes.

"I thought using the 1000cm^3 paper to make a cube can maximise its volume, so, I made the same side length 1000 and the volume is 1000cm^3 . But he (refer to student E) made a larger cuboid, which is 1352cm^3 ." Stated student F.



Student E



Student F

Figure 11 Students' work

Then, I guided student F, "Do you think you can create a larger box?"

"Yeah, I think the volume is based on the area of the base and height. But this is enough for me because I would like to put dried flowers in it. My mom is good at making dried iris and roses."

My EAL students actively participated in sharing their cultures and personal experiences with their peers and me (Schleppegrell, 2011). Through these communications, they confidently expressed their mathematical ideas (Sáenz-Ludlow & Presmeg, 2006) and practised their proficiency in the mathematical language (Barwell, 2009), which was evident

through their usage of Mathematical registers, such as "length," "base," "height," "volume," and "area."

3.3 Evaluations

This section aims to assess the strategies employed in my designed lesson and highlight their advantages and disadvantages, as supported by relevant findings from the literature review.

1. Visual aids

Based on my observation, it is evident that visual strategies, particularly digital animations, have helped students develop a deeper understanding of abstract Mathematics registers, such as "cross-sections," "prisms," "pyramids," and "constants". Corresponding to Pimm's (1987) recommendations, I worked a dual role as mathematics teacher and language supporter, modelling language, guiding EAL students to correct their mistakes and providing immediate feedback.

In addition to demonstrating how the cross-section changes in a prism, I explained that the cross-section remains the same size in a prism, which is known as a uniform cross-section. I also corrected student A's statement, *"It has a sharp top instead of a flat base,"* to *"The cross-section on the pyramid is not the same size as the base."* Although EAL students faced various language-related challenges while justifying their answers, my analytical observations indicated that those discussions and written tasks improved their English proficiency and critical thinking as students were able to integrate language and mathematical skills in explaining and supporting their solutions in English (Trakulphadetkrai et al., 2020).

2. Solving contextual problems

The core idea of the real-life contextual problem of fitting bricks into a cuboid box is to help EAL

students foster a concrete comprehension of abstract concepts and apply them in real-world situations (Sáenz-Ludlow & Presmeg, 2006). Students' responses illustrated that the use of animations depicting the arrangement of cubes into cuboid boxes further supported them in visualising the spatial relationships between the small bricks and the big container (Nguyen & Cortes, 2013).

As mentioned in section **3.2.2**, this activity also revealed pupils' common difficulty in solving real-life "fitting" problems that many students mistakenly divided the larger volume directly by the smaller volume. With some guidance that prompted them to consider the physical nature of the bricks and visualise the difference between bricks and water, students were able to rectify their errors. This paper primarily attributes this misconception to a language issue for EAL students, as their unfamiliarity with specific vocabularies, such as "bricks," hindered their problem-solving abilities. This observation aligns with Barwell's findings (2009), which stated that cultural or linguistic differences can impact students' comprehension of contextual problems.

However, I have acknowledged that there could be other factors influencing students' understanding of these fitting problems. For instance, the absence of considering the dimensions of the box in the given example might also contribute to confusion. Therefore, it may be necessary for teachers to provide clearer instructions and a variety of relevant examples, especially when teaching a class with a significant number of EAL learners (Solomon & Black, 2008).

3. Hands-on activities

This hands-on activity aligns with Sáenz-Ludlow and Presmeg's study (2006), which demonstrates its effectiveness in developing EAL students' language proficiency through meaningful discussions. Further, the activity might develop students' visual and spatial

skills (Nguyen & Cortes, 2013) as they physically explore the concept of volume and apply it to real-world scenarios, such as constructing boxes.

However, it might be significant to recognize potential language and cultural barriers that may impact students' problem-solving abilities. Following Barwell's recommendations (2009), teachers should consider the diverse cultures and backgrounds of their EAL students and incorporate inclusive scenarios. In line with this approach, I encouraged students to choose cultural items to place inside the box and thus further guided them to think critically about how altering the base or height could result in a larger box. These types of activities appear to be beneficial in creating an inclusive and interactive learning environment.

4. Conclusions

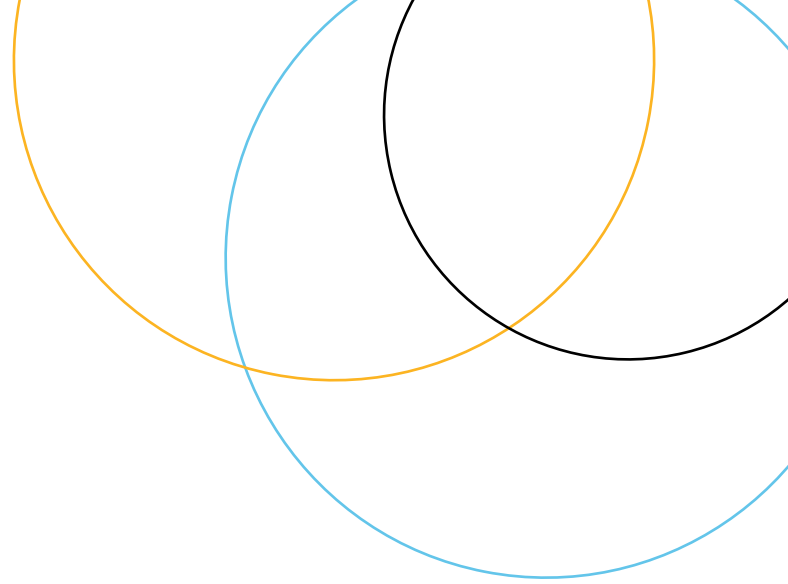
This project was undertaken to conduct language-responsive strategies to support EAL learners' Mathematical learning in 3D solids. Consistent with the results of previous studies (e.g., Schleppegrell, 2011; Barwell, 2009, etc.), this study has identified EAL students' common difficulties in understanding and applying Mathematics registers (Halliday, 1979), such as reading Mathematics and solving real-life contextual problems. This might be because of their cultural backgrounds, lack of English proficiency and unfamiliarity with Mathematics registers or typical vocabularies (Barwell, 2009).

To help EAL students overcome these language-related difficulties, I incorporated several language-responsive strategies as suggested by previous researchers into my lesson (e.g., Nguyen & Cortes, 2013; Jourdain & Sharma, 2016; Sáenz-Ludlow & Presmeg, 2006). Based on my observations, 3D animations and physical manipulatives appear to help reduce the language load of mathematics, allowing EAL students to quickly understand and remember concepts (Nguyen & Cortes, 2013). Using concrete contexts, such as fitting bricks into a cuboid box, can also

help EAL learners apply mathematical knowledge to real-life situations and process information in both English and Mathematics (Jourdain & Sharma, 2016). However, teachers are suggested to take into account the importance of using appropriate spoken language and providing supportive guidance in order to implement these strategies more effectively (Sáenz-Ludlow & Presmeg, 2006). For instance, teachers might guide pupils to critically think about whether their answers are proper in a real-life scenario instead of directly revealing that they got the incorrect answers.

Although this paper has identified several language challenges that EAL learners may encounter in solving contextual problems and expressing Mathematical ideas, I have also acknowledged that some of these challenges may be common among native speakers as well. I believe that factors other than being EAL might also contribute to the difficulties in understanding specific Mathematics registers, reading Mathematics and solving word problems. Therefore, further research could be conducted to explore these factors and other strategies to better support inclusive and language-responsive teaching.

References



The Traumatic Memory Paradox: A Meta-Analysis of PTSD Treatment Modalities through Sleep Deprivation Mitigation

Ignacio Esclamado Cadenas

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PTSD Treatment Modalities and Sleep Outcomes

Post-Traumatic Stress Disorder (PTSD) is a debilitating condition that can emerge following exposure to traumatic events, such as combat, assault, or natural disasters. Characterized by symptoms like intrusive thoughts, hyperarousal, and emotional numbing, PTSD affects millions worldwide and significantly impacts mental health and quality of life. The interplay between PTSD and sleep disturbances has garnered substantial research interest, with growing evidence suggesting that sleep problems are not merely secondary symptoms but may play a critical role in the onset and persistence of PTSD.

PTSD is defined by the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) as a mental health condition that can develop in individuals who have experienced or witnessed a traumatic event. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), published by the American Psychiatric Association - PTSD is the development of characteristic and noxious

symptomology following exposure to one or more traumatic events. These symptoms are part of the criteria required to diagnose PTSD in accordance with DSM-5-TR, and are grouped into eight clusters (American Psychiatric Association, 2013):

- A: Exposure to actual or threatened death, serious injury, or sexual violence in one (or more) ways.
- B: Presence of one (or more) intrusion symptoms associated with the traumatic event(s), beginning after the traumatic event(s) occurred.
- C: Persistent avoidance of stimuli associated with the traumatic event(s), beginning after the traumatic event(s) occurred, presenting at least two .
- D: Negative alterations in cognitions and mood associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, presenting at least two.
- E: Marked alterations in arousal and reactivity associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, presenting at least two.
- F: Duration of the disturbance (Criteria B, C, D, and E) is more than 1 month.

- G: The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
- H: The disturbance is not attributable to the physiological effects of a substance (e.g., medication, alcohol) or another medical condition.

These symptoms can lead to significant distress and impairment in social, occupational, or other important areas of functioning (Yehuda, 2007). The lifetime prevalence of PTSD in the general population is estimated to be around 8%, with rates rising significantly among combat veterans and victims of interpersonal violence (Bisson et al., 2013).

Sleep disturbances are prevalent and present as comorbidities among individuals with PTSD, with complaints of insomnia, nightmares, and fragmented sleep being common (Germain et al., 2006). Research indicates that these disturbances are more than just a secondary feature of PTSD. Instead, they may contribute to the disorder's persistence by impairing emotional regulation and exacerbating symptoms such as anxiety and depression (Spoormaker & Montgomery, 2008; Alhola & Polo-Kantola, 2007). Sleep is vital for emotional and cognitive functioning, and disruptions can have far-reaching effects on mental health. For instance, REM sleep, which is critical for emotional memory processing, is often disrupted in PTSD, leading to difficulties in processing traumatic memories (Walker & van der Helm, 2009). Moreover, the sleep deprivation that occurs as a result has been shown to impair cognitive performance and emotional regulation, exacerbating PTSD symptoms and making recovery more challenging (Killgore, 2010; Harvey et al., 2005). Insufficient sleep can therefore lead to heightened emotional reactivity and reduced ability to cope with stress, further entrenching the disorder (Minkel et al., 2012).

Discussion

PTSD mechanisms of action

The HPA axis: PTSD mechanisms of action center around the over expression of stress hormones, triggered through the reliving of a traumatic event (both consciously and sensory). Physiologically, PTSD centers around the Hypothalamic-Pituitary-Adrenal (HPA) axis – an endocrine network encompassing many roles, including stress endocrine action. It involves a complex interaction between the hypothalamus, pituitary gland, and adrenal glands, culminating in the release of cortisol, a primary stress hormone. In individuals with PTSD, there is often a marked dysregulation of the HPA axis. Studies have found that PTSD can be correlated with both increased basal levels of cortisol and altered cortisol responses to stress. Some research indicates hyperactivity of the HPA axis, leading to elevated cortisol levels seen (Yehuda & LeDoux, 2007). This chronic elevation can contribute to the persistence of PTSD symptoms by disrupting the body's ability to return to baseline after stress. As such, it is no surprise that elevated levels of Corticotropin-Releasing Factor (CRF) – a hypothalamic hormone responsible for triggering corticotropin (in turn a component of the HPA axis) – have been observed in PTSD. CRF's target organ is the anterior pituitary gland, where corticotropin, a second stress hormone, is then released and exported to the adrenal cortex, triggering the release of cortisol into the anterior pituitary and hypothalamus (van der Kolk, 2014) (Daskalakis et al., 2016).

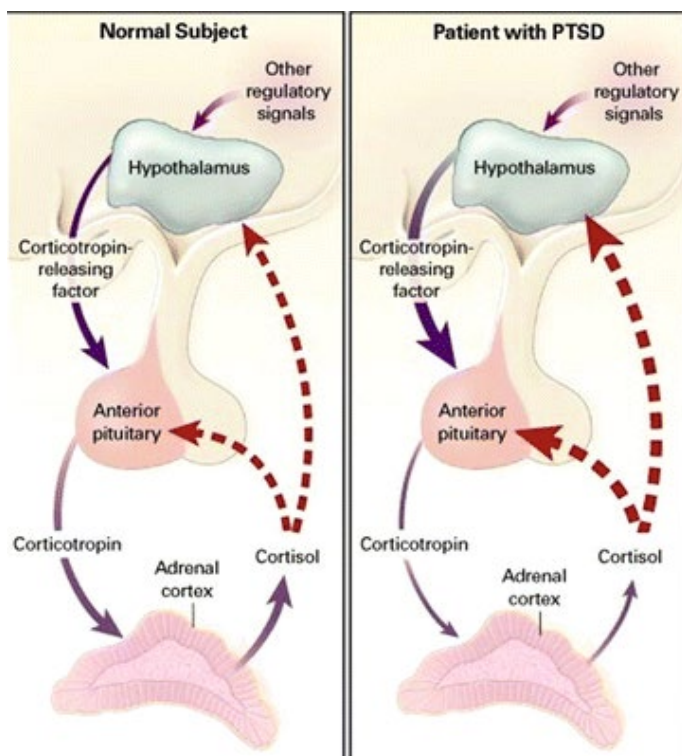


Figure 1: Diagram of HPA axis function under normal and PTSD conditions.

Note: Whilst normal stress response can be generated from any stressor source, reliving traumatic stress events triggers a “simulated” sensory output comparable to real-time sensory input rather than sensory recall – suggesting that PTSD patients quite literally relive their traumatic event over and over as if it was the first time (van der Kolk, 2014) (Figure source: Daskalakis et al., 2016 - adapted).

The traumatic memory paradox: In PTSD, there is evidence of hyperactivity in the amygdala – the mediation site for CRF-expressing neurons. Persistent CRF elevation can perpetuate the stress response, creating a feedback loop that perpetually sustains a state of persistent hyperactive emotional reactivity, as well as the persistent experience of fear (Shin et al., 2004). This hyperactivity can lead to exaggerated responses to trauma-related cues and longer, culminating in the generation of the state of hyperanxiety that is hallmark to PTSD diagnoses. (Binder et al., 2008). It is crucial to understand that traumatic memories in PTSD are often fragmented and not integrated properly into existing memory networks. This fragmentation

can result in vivid and distressing re-experiencing of the trauma. Unlike non-traumatic memories, which are typically processed and contextualized within a coherent narrative, traumatic memories may remain as isolated sensory and emotional fragments (Brewin et al., 1996), a symptom which occurs as both the hippocampus and the prefrontal cortex are also affected under PTSD’s mode of action. The hippocampus, responsible for memory formation and contextual processing, can become impaired when exposed to high levels of stress hormones (e.g. cortisol), which in turn may impair the ability to accurately contextualize and integrate traumatic autobiographical memories, leading to intrusive recollections, difficulties in distinguishing between past and present threats, and fragmentation of traumatic memory formation (McEwen & Morrison, 2013) (Bremner et al., 2003). On the other hand, the prefrontal cortex (PFC) – responsible for executive functions, including emotional regulation and decision-making – sees reduced activity, impairing normal emotional regulation responses and flooding the brain with enhanced, dysregulated emotions – the nature of which depends on the recollection of the traumatic event. (Van Elzinga & Bremner, 2005). Even further, Brodmann’s area 19, located in the visual cortex, is a region responsible for the encoding of new images into memory. Interestingly, this area sees markedly increased activity during traumatic episodes, indicating that PTSD patients quite literally see a traumatic event as if it were happening in real time – and because hypothalamic function is also compromised, the patient is forced to relive the event as if it were the first time. The experience is further defined by the severely reduced activity seen in Broca’s area; a speech center responsible for translating thoughts into verbal communication – resulting in the loss of verbal communication during an episode. This means that not only is the patient forced to relive the experience itself but is also “enhanced” through a combined dysregulation of the hippocampus, prefrontal cortex, Brodmann’s area 19 and Broca’s area (Van Elzinga & Bremner, 2005) (Binder et al., 2008).

Ultimately, for the patient, the large-scale combination of dysfunction and dysregulation of several brain regions results in a hellish memory paradox – an involuntarily recall/reliving of a traumatic experience as if it were the first time (unaware that they are witnessing a memory), forced to rewatch and re-feel these events (with heightened emotion), whilst losing the ability to talk through the experience altogether – all during a perpetually heightened fear state. (Van Elzinga & Bremner, 2005), (Van der Koolk, 2014).

Sleep symptomology for PTSD treatment targets

It is imperative to remember that the effects of sleep are far and wide throughout both the mind and body, and research is still being conducted as to the full list of effects – and effect strength – on every area of human physiology and psyche (Walker, 2018). Some of the areas include emotional regulation, memory consolidation and extinction, immune system regulation and removal of toxic compounds from organs (especially the brain), to name some examples (Walker, 2018). For Post-Traumatic Stress Disorder, sleep deprivation is considered a comorbidity – as it is a key factor in the perpetuation of other comorbidities present in PTSD patients (APA, 2013) and as such treatments to alleviate sleep deprivation aim to treat the base of the disorder through the disruption of the feedback loop this comorbidity creates.

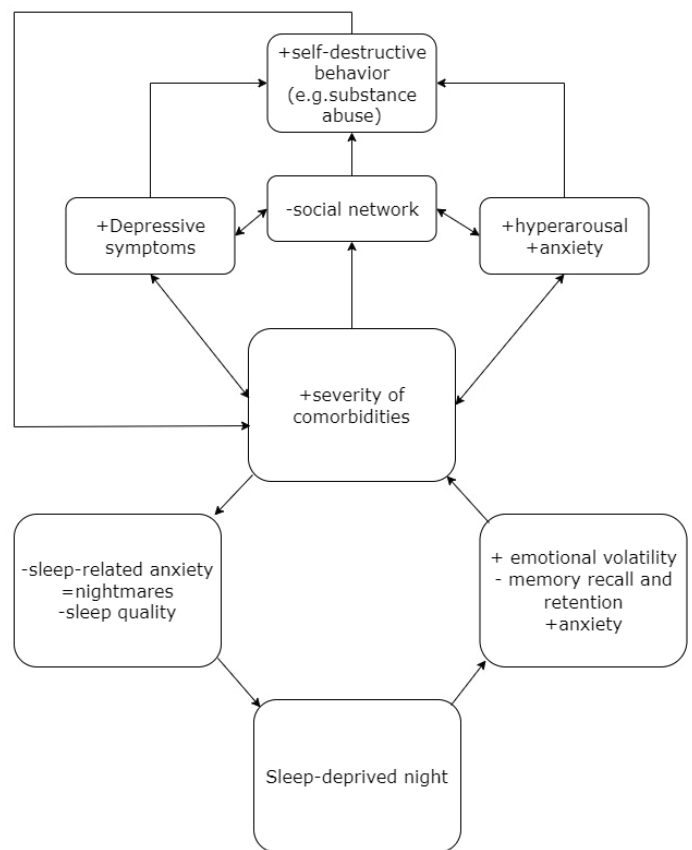


Figure 2: PTSD-sleep deprivation negative feedback loop

Note: A flowchart illustrating the feedback loop present in PTSD patients. Trapped in an endless loop, it is essential to break the cycle in order to facilitate healing. (Made from information in Walker, 2018).

Sleep Deprivation as a Result of Sleep-Related Anxieties: Firstly, sleep deprivation exacerbates the existing hyperarousal and anxiety feedback loop present in PTSD patients. Studies indicate that sleep disturbance may not only be a symptom of PTSD but also a contributor to its maintenance - affecting the negative impact of poor sleep on the limbic system, the brain's emotional center, which becomes more reactive under stress and sleep deprivation (Babson & Feldner, 2010). Sleep deprivation in PTSD is usually maintained through at least one – but very likely a combination of – sleep anxiety disorders and comorbidities stemming from the physiological issues generated by the dysregulation of stress hormones (van der Koolk, 2014):

- **Nightmares:** The vicious cycle present in PTSD can be compounded by the presence of nightmares and night terrors, a common comorbidity in PTSD. This not only disturbs sleep further but can also lead to a fear of sleeping due to the anticipation of nightmares (Davis & Wright, 2007). These nightmares can appear either in tandem or as a precursor to several anxieties, and can feed either off of or supplement other anxieties listed here (Mellman, 2008).
- **Sleep Onset Anxiety:** An example of one of these anxieties is Sleep Onset Anxiety (SOA), where the prospect of going to sleep itself can induce anxiety. For PTSD patients, this is most commonly due to the fear of experiencing nightmares or reliving traumatic events during dreams (Krakow et al., 2001). The anxiety about anticipated sleep disturbances can make it challenging for them to fall asleep, resulting in prolonged periods of wakefulness and a condition known as sleep onset insomnia (Pigeon et al., 2013).
- **Nocturnal Panic Attacks:** A similar outcome will occur after some individuals may experience nocturnal panic attacks when transitioning from wakefulness to sleep. These episodes are characterized by sudden awakenings accompanied by intense fear and physiological symptoms such as palpitations, shortness of breath, and sweating, with reoccurring attacks being able to lead to fear of sleep, as individuals worry about recurrent episodes disrupting their rest.
- **Hypervigilance:** Enhanced fear states can induce a state of hypervigilance, where the individual remains excessively alert to detect potential threats with no immediate environmental cause (Germain, 2013). This state can be particularly pronounced at night in the dark and quiet environment, making it difficult to relax and fall asleep. The lack of sensory input paradoxically increases the individual's alertness, increasing anxiety and further impeding sleep (Germain, 2013).

Cognitive, Psychological and Emotional Impact of Sleep Deprivation: As previously mentioned, the impact of sleep deprivation has a tremendous, but indirect impact on the severity of physiological symptoms, oftentimes providing stressors that feed the feedback loop sustaining HPA axis hyperactivity.

- **Hyperarousal:** A core symptom of PTSD, sleep deprivation is known to cause irritability, exaggerated startle response, and difficulty concentrating even in non-PTSD individuals. However, sleep deprivation can exacerbate PTSD symptoms, leading to heightened emotional responses to stressors, increased irritability and feeding the HPA axis hypersensitivity (Spoormaker & Montgomery, 2008). Hyperarousal oftentimes also perpetuates rumination, a repetitive and negative form of thinking, often observed in individuals with PTSD. This can further contribute to anxiety and depression by reinforcing negative thought patterns and emotional distress patterns already solidified in a patient's symptomology (Harvey et al., 2005).
- **Mood Disturbances:** Chronic sleep disturbances are strongly associated with mood disorders such as depression and anxiety notable comorbidities of PTSD (APA, 2013). The persistent cycle of poor sleep can lead to significant mood impairments, complicating the clinical picture of PTSD (Babson & Feldner, 2010). Insufficient sleep affects the brain's ability to process emotions, often resulting in increased sensitivity to negative stimuli and decreased ability to regulate emotions (Walker & van der Helm, 2009). This can evolve into more serious cases, with individuals with PTSD often struggle with emotional dysregulation, a difficulty in managing and responding to emotional experiences appropriately. This is because sleep deprivation further impairs the prefrontal cortex, the brain region responsible for emotion regulation, leading to increased emotional volatility and decreased coping

abilities (Goldstein & Walker, 2014) – hallmark depressive symptoms. Sleep disturbances in PTSD are linked to higher rates of depression, with studies showing that insomnia can predict the onset of depressive symptoms. Sleep deprivation alters the functioning of neurotransmitter systems involved in mood regulation, contributing to depressive symptoms (Baglioni et al., 2011).

- **Functioning Impairments:** Sleep disturbances in PTSD can lead to cognitive impairments, affecting memory, attention, and executive function. These cognitive deficits can hinder daily functioning and exacerbate PTSD symptoms by impairing the ability to process and respond to stressors effectively (Minkel et al., 2012). The impairment in functioning also affects memory consolidation, a process critical for learning and adapting to new experiences. Normally, sleep is responsible for the production of memory spindles during REM sleep, which are then solidified overnight (Walker, 2018) – and when the process is disrupted in a non-PTSD individual, the reduction in memory retention is unspecific. For individuals with PTSD, however, disrupted sleep further impairs the ability to process and integrate traumatic memories, potentially reinforcing the persistence of intrusive memories and flashbacks (Stickgold, 2002).

Furthermore, the psychological and emotional impacts of sleep disturbances extend beyond the patient to social and interpersonal functioning. Individuals with PTSD may experience difficulties in relationships due to increased irritability and communication challenges (Krakow et al., 2002). This, in turn, can lead to social withdrawal and isolation, as individuals may become socially introverted as they become more irritable or lack the energy and motivation to engage with others – which in turn may cause the increased irritability and emotional dysregulation to lead to conflicts in relationships, both personal and professional. This can strain social support networks, which are crucial for coping with the

increased rate of loneliness and alienation seen in PTSD symptomology (Cook et al., 2004) (Klein et al., 2003). If severe enough, it can lead to the development of a higher severity of comorbid conditions such as depression, anxiety, and substance abuse (Germain et al., 2006), all which feed into each other as well as other comorbidities. – The likelihood of engaging in self-destructive behaviors, such as substance abuse, increases with the presence of sleep issues. This can be attributed to the misuse of substances as a coping mechanism to deal with insomnia or the emotional distress caused by PTSD (McGuire et al., 2011), in turn both feeding and being fed by an increase in depressive symptoms, where insufficient sleep affects neurotransmitter and stress hormone levels, which can exacerbate depressive states (Franzen & Buysse, 2008). The interaction between sleep deprivation and these comorbid conditions often leads to the cycle seen in Figure 2.

Therefore, sleep disturbances significantly contribute to the perpetuation of PTSD symptoms. The interplay between sleep deprivation and PTSD forms a vicious cycle where each condition exacerbates the other, and affects virtually every other comorbidity or potential comorbidity possible – augmenting sleep-related anxieties, (such as nightmares and hypervigilance), cognitive and emotional functions, impairing mood regulation and memory consolidation whilst increasing the risk of comorbidity, such as depression, to an already ruthless symptomology. As such, breaking this cycle by improving sleep quality is crucial for PTSD recovery, especially those addressing sleep disturbances.

Comparing pharma vs non-pharma approaches

Pharmaceutical approaches to treating Post-Traumatic Stress Disorder (PTSD) focus on targeting the neurochemical pathways involved in the regulation of mood, anxiety, and sleep. These approaches are often used to alleviate the core symptoms of PTSD, such as intrusive thoughts, hyperarousal, avoidance, and sleep disturbances.

- **Selective Serotonin Reuptake Inhibitors (SSRIs):** SSRIs are typically the first-line pharmaceutical treatment for PTSD due to their safety profile and efficacy in treating a broad range of anxiety and mood disorders. Common SSRIs prescribed for PTSD include sertraline (Zoloft) and paroxetine (Paxil), both of which have received approval from the U.S. Food and Drug Administration (FDA) for this indication (Bisson et al., 2013). SSRIs have been shown to reduce the severity of PTSD symptoms, particularly in the domains of re-experiencing, avoidance, and hyperarousal. Studies such as Berger et al., 2009 have demonstrated their efficacy in both short-term symptom reduction and long-term maintenance of symptom relief. However, while SSRIs are effective for many patients, not everyone responds to these medications. With an effectiveness rate “varying from 40 to 60 percent [with] remission rates vary[ing] from 30 to 45 percent” (Agency for Healthcare Research and Quality (AHRQ), 2010). Additionally, some patients may experience side effects, including sexual dysfunction, weight gain, and insomnia, and may take several weeks to exert their full therapeutic effects, which can be a drawback for patients seeking rapid relief from symptoms (McRae et al., 2004).
- **Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs):** SNRIs, such as venlafaxine (Effexor) and duloxetine (Cymbalta), are another class of antidepressants used in the treatment of PTSD. These medications are often considered when SSRIs are ineffective or poorly tolerated. SNRIs instead inhibit the reuptake of both serotonin and norepinephrine, leading to increased levels of these neurotransmitters in the brain. This dual-action mechanism can enhance mood stabilization and reduce anxiety, and as such have been found to be effective in reducing these PTSD comorbidities. Venlafaxine, in particular, has shown promise in clinical trials, demonstrating improvements in both PTSD symptoms and overall functioning

(Davidson et al., 2001). However, due to the similarities in mechanisms of action of SSRIs, SNRIs may cause side effects such as nausea, dizziness, dry mouth, and sexual dysfunction. Additionally, discontinuation of SNRIs can lead to withdrawal symptoms, which require careful management and may prevent patients with histories of substance addiction disorder to be treated with either SSRIs or SNRIs (APA, 2013).

- **Benzodiazepines:** Benzodiazepines, such as lorazepam (Ativan) and clonazepam (Klonopin), are sometimes used for short-term management of acute anxiety and sleep disturbances in PTSD patients. Benzodiazepines enhance the activity of gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter that is part of an inhibitory pathway resulting in sedative, anxiolytic, and muscle-relaxant effects, depending on signal intensity. These medications can provide rapid relief of anxiety and insomnia symptoms – However, their use is controversial due to the potential for dependence and withdrawal symptoms (Davidson, 2001). Further, long-term use of benzodiazepines is generally discouraged due to the exponential risk of tolerance buildup, dependence, and/or cognitive impairment – as such, these are typically reserved for short-term use or in situations where other treatments are ineffective or contraindicated.

Non-Pharmaceutical Approaches to PTSD Treatment

Non-pharmaceutical treatments, such as Cognitive Behavioral Therapy for Insomnia (CBT-I) and Rapid Eye Movement (REM) Desensitization, focus on addressing the root causes of sleep disturbances, making them valuable tools in PTSD treatment (Ho et al., 2016; van der Kolk, 2014). In addition, non-pharmaceutical interventions can be adapted for diverse patient populations and settings, often with fewer side effects than medications. This makes them favorable for

long-term management and relapse prevention, especially in patients with a history of medication non-compliance or adverse reactions (Krakow et al., 2001; Pigeon et al., 2013).

Non-pharmaceutical approaches to treating Post-Traumatic Stress Disorder (PTSD) have gained significant attention as complementary or alternative options to traditional medication-based therapies. These approaches often focus on psychological, behavioral, and holistic interventions that target the underlying causes and symptoms of PTSD without the use of drugs. This essay will explore various non-pharmaceutical treatments, including their mechanisms, effectiveness, and the contexts in which they are most beneficial.

Cognitive Behavioral Therapy (and for Insomnia) (CBT + CBT-I): Cognitive Behavioral Therapy (CBT) is a well-established psychological treatment for PTSD that aims to change maladaptive thought patterns and behaviors related to trauma. This therapy works by helping individuals identify and challenge distorted thoughts about traumatic events, replacing them with more balanced and realistic perspectives. CBT also employs exposure techniques that allow patients to confront and process traumatic memories in a safe and controlled setting. Research has consistently demonstrated the effectiveness of CBT in reducing PTSD symptoms, showing significant improvements in areas such as re-experiencing, avoidance, and hyperarousal. CBT is widely regarded as one of the most effective non-pharmaceutical treatments for PTSD (Powers et al., 2010). However, the therapy requires active participation and motivation from patients, which can be difficult for some individuals. It also demands skilled therapists and may take several weeks or months to produce significant improvements.

An important adaptation of CBT for PTSD is Cognitive Behavioral Therapy for Insomnia (CBT-I), which targets sleep disturbances often associated with trauma. CBT-I focuses on changing behaviors and thoughts that disrupt sleep, providing

strategies to improve sleep hygiene and establish regular sleep patterns by addressing insomnia – or chronic sleep deprivation. By improving sleep quality, CBT-I can contribute to overall symptom reduction and enhance the effectiveness of PTSD treatment. However, both CBT and CBT-I require active participation and motivation from patients, which can be challenging for some individuals, especially from veteran demographics (van der Kolk, 2014). These therapies demand skilled therapists and may take several weeks or months to produce significant improvements.

Eye Movement Desensitization and Reprocessing (EMDR): Eye Movement Desensitization and Reprocessing (EMDR) is another psychotherapy approach used to process traumatic memories through bilateral sensory input, such as eye movements, taps, or tones. During EMDR sessions, patients recall distressing memories while simultaneously focusing on external stimuli, such as therapist-directed eye movements. This process is thought to assist the brain in reprocessing traumatic memories and integrating them into a more adaptive cognitive framework. EMDR has been shown to reduce PTSD symptoms and improve emotional regulation in patients. Meta-analyses indicate that EMDR is as effective as CBT for treating PTSD and may lead to faster symptom relief (Bisson et al., 2013). However, the precise mechanism of EMDR's effectiveness is not fully understood, and some critics argue that the bilateral stimulation component may not be necessary. EMDR also requires specialized training for therapists (van der Kolk, 2014).

Prolonged Exposure Therapy (PET): Prolonged Exposure Therapy (PET) is a specific form of CBT that involves repeated and extended confrontation with trauma-related memories, situations, and objects. This therapy helps patients reduce their fear and anxiety related to trauma by gradually facing and processing traumatic memories and cues in a secure therapeutic environment. This process decreases avoidance behaviors and promotes emotional processing - PE has been extensively studied and is considered a highly effective treatment for PTSD, significantly

reducing symptom severity and improving overall functioning (Foa et al., 2008). However, PE can be emotionally challenging for patients, as it requires them to confront distressing memories repeatedly. It may not be suitable for individuals experiencing severe dissociation or those not ready to engage with traumatic material.

Conclusion

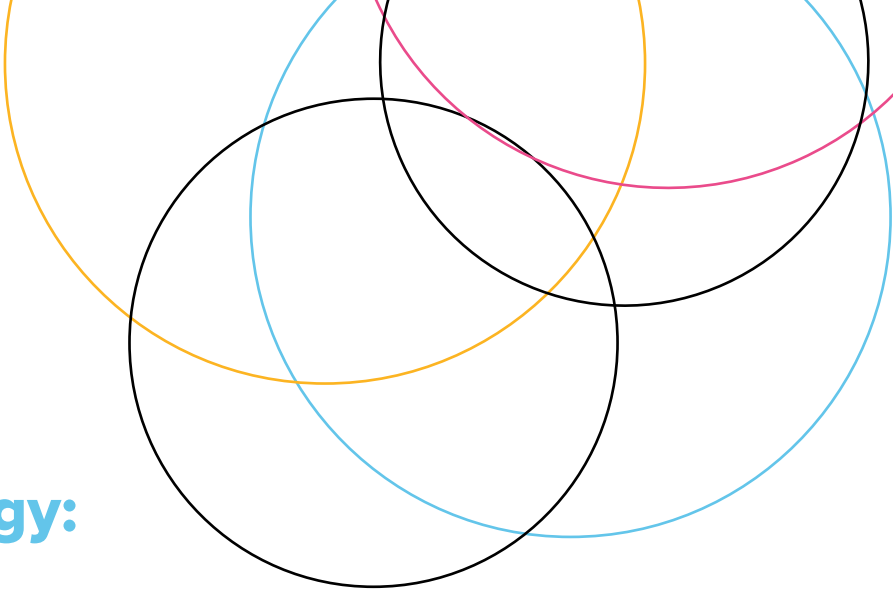
This dissertation offers a detailed examination of the efficacy of various interventions for treating Post-Traumatic Stress Disorder (PTSD), particularly focusing on sleep comorbidities, through a meta-analysis of 31 selected studies. Initial findings indicate that while the overall p-value average suggested a potential for statistical significance, the detailed subgroup analysis exposed important differences. Specifically, pharmaceutical interventions showed limited statistical significance, particularly in combat-related and mixed trauma contexts, suggesting that these interventions may not be as effective in addressing PTSD-induced sleep deprivation related to these specific trauma types. In contrast, non-pharmaceutical treatments such as Cognitive Behavioral Therapy for Insomnia (CBT-I) and Imagery Rehearsal Therapy (IRT) exhibited slightly more promising results, especially for civilian trauma. The statistical significance of these treatments in the civilian subgroup suggests they may offer more effective solutions compared to pharmacological approaches for this population.

References





**Guest
contribution**



Periods and Pedagogy: The Impact of the Menstrual Cycle on Teachers' Emotions and the Effectiveness of a Coaching Intervention

By Bethany Moxon (MSc in Teacher Education
at Oxford University, 2022-24 cohort)

1. Introduction

In 2017, I attended an event in London where I heard a lady called Claire Baker talk about something called menstrual cycle awareness; the idea that the menstrual cycle has four distinct phases, each with their own unique 'shadows' and 'joys.' By getting to know one's unique cycle, individuals can be empowered to live more harmoniously with their hormonal ebbs and flows. The concept had a profound impact on me, and alongside my career in Education, I embarked on a training course to become a menstrual cycle coach. I have since spent five years working for a charity ITT provider training teachers, and more recently joined a large secondary school in Sussex as a Director of 6th Form. Alongside this, I run my own social enterprise, Bloom & Belong, delivering period education workshops and events for a large range of people both in schools and communities. In my experience over the last

decade of working with, mentoring and training teachers, I have observed the unique and often significant impact the menstrual cycle can play in women's working lives as teachers. I have cultivated a growing interest in exploring whether we might be missing an opportunity in teacher CPD to incorporate conversation and reflection about women's health issues, specifically the menstrual cycle.

The idea came to fruition when discussing ideas for my second-year dissertation project as part of my MSc in Teacher Education at the University of Oxford. Our cohort had been tasked with completing action research (Menter et al., 2011) whereby we had to research an area of teacher education and develop, deliver and evaluate an intervention. I was speaking with my supervisor and mentioned my interest in this area, and to my surprise and joy my supervisor encouraged me straight away to go for it, recognising the importance and urgent need for this type of research. In 2022, the government announced a 10-year Women's Health Strategy for England, that acknowledged the under-representation of women in research and clinical trials. In their call for evidence survey which received over 100,000 responses, only 17% of respondents felt equipped to manage their menstrual wellbeing (Department of Health & Social Care, 2019). Additionally, the menstrual cycle remains shrouded in shame and secrecy, which perpetuates all areas of society, including education:

The stigma and shame generated by stereotypes around menstruation have severe impacts on all aspects of women's and girls' human rights, including their human rights to equality, health, housing, water, sanitation, education, freedom of religion or belief, safe and healthy working conditions, and to take part in cultural life and public life without discrimination. (United Nations, 2019)

The project aimed to explore the impact (if any) of the menstrual cycle on the emotions of three teachers, and to establish whether a coaching intervention could support them in addressing an area of practice they identified as affected by their cycle. The project sits at a unique intersection between women's health (specifically the menstrual cycle) and teaching practice and contributes to the fast-growing interest and research into the menstrual cycle (Brown & Knight, 2021; Brown et al., 2022; Gjellestad, 2023; Sang et al., 2021).

2. The Literature

Reviewing the literature about the emotional impact of the menstrual cycle highlighted the premenstrual phase as particularly challenging, with many women experiencing symptoms such as irritability, anxiety and mood swings (Collins Reed et al., 2008). Concepts such as menstrual etiquette (Law, 1990), and 'blood work' (Sang et al., 2021) were helpful in making sense of some of the challenges menstruators can face in the workplace.

Menstrual etiquette has been defined as 'the expectations and behaviours that dictate how menstruators, particularly women, are meant to behave during their menstrual period. Specifically, referring to the act of concealing and hiding any signs of menstruating, like the menstrual products and menstrual talk' (Saladrigas Clemente, 2023, p.28). Law (1990) argued that society perceives the biological feature of menstrual blood as disgusting, thereby creating social norms that enforce the fear of consequences in women if they reveal their menstruation.

A qualitative survey of 627 employees in the UK higher education setting (Sang et al., 2021) aimed to understand how people manage their menstrual cycles in the workplace. They concluded that there is a unique form of emotional and physical labour, which they labelled 'blood work', that can be split into four key areas: 'managing painful and leaky bodies, accessing adequate facilities, stigma, and managing workload' (Sang et al., 2021, p. 2). Many respondents alluded to additional labour in disguising any sign of menstruation from colleagues, which they felt would cause embarrassment and shame, for example by taking spare clothes into work. In addition, they felt that the emotions associated with the premenstrual stage of the cycle were stigmatised in the workplace and went to great lengths to mask these feelings.

I then went on to explore the complex literature body about teachers' emotions, focusing mainly on antecedents to emotions (because I was researching whether the menstrual cycle was one), and the processes by which teachers experienced their emotions and their consequent actions (because I was going to develop a coaching intervention to support them with this). Chen's (2021) Teacher Emotion Model attempted to conceptualise the complexities around teacher emotions:

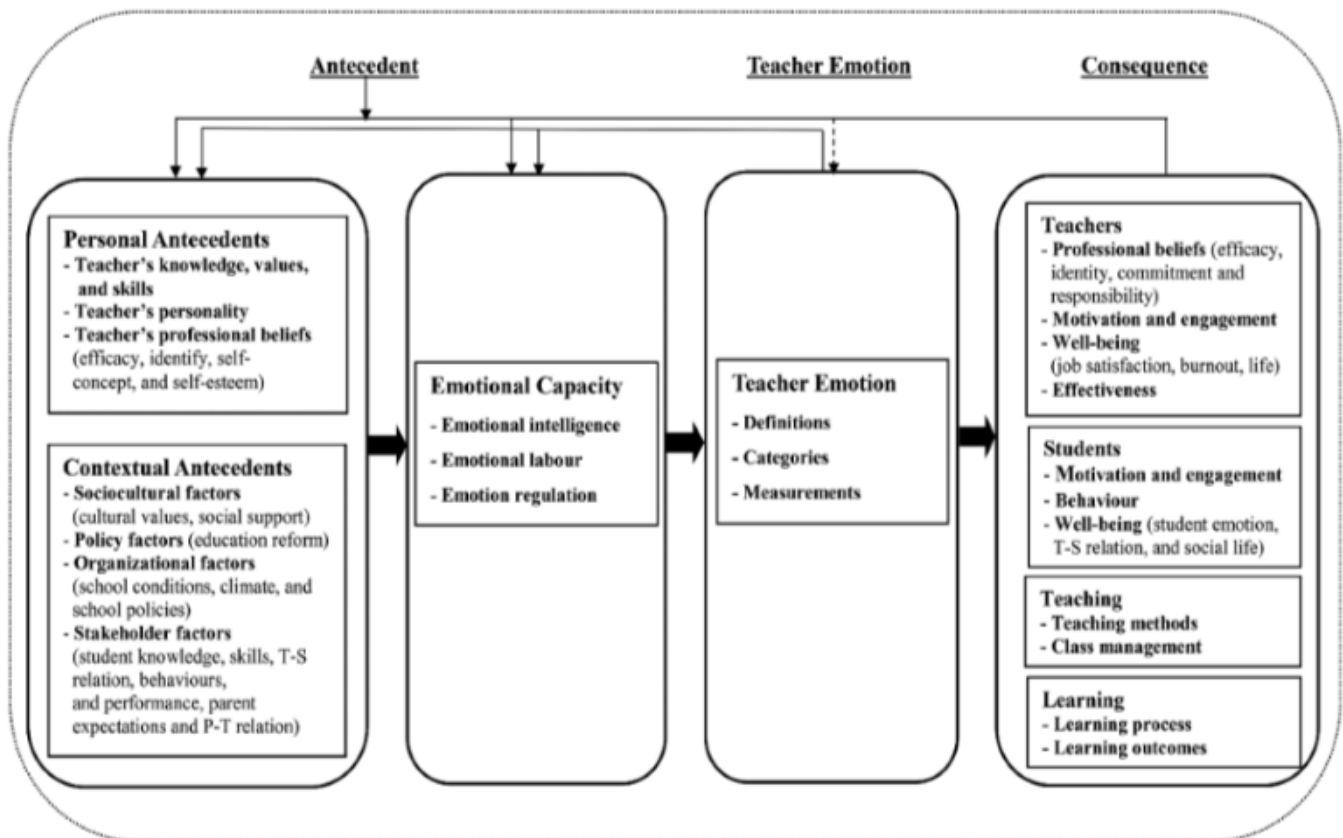


Figure 1: Chen's Teacher Emotion Model (2021)

The literature suggested that teacher beliefs and student behaviour can act as an antecedent to teacher emotions. For example, Hagenauer et al. (2016) interviewed 15 Australian teachers and nine German teachers to understand more about their professional beliefs about emotions in teaching. Both groups believed that displays of positive emotions were important to teaching, and that negative emotions should be controlled to maintain professionalism. However, there were differences between the Australian and German teachers, so it would be presumptuous to generalise these findings to the UK context. Regarding student behaviour, Frenzel (2014) argued that teachers' appraisals of the situations they face in the classroom impact their emotions and response, and Schutz et al. (2006) stated that this was related to their pursuit of a particular goal. For example, the teacher may intend to review previously taught material following an assessment, and if they perceive that students' behaviour acts a barrier to this, then their response would evoke a more negative emotion.

Two other important concepts that arose in the teachers' emotions literature were emotional labour (Hoschild, 1983) and emotion regulation (Gross, 1998).

Originally developed by Hoschild (1983) as a concept that encapsulated the effort involved in demonstrating behaviours that are desired by an organisation, emotional labour has been researched extensively. Within an educational context, it has been defined as 'the effort teachers must employ to control their emotion display and regulate emotions that may compromise their teaching goals' (Molyneux, 2021, p. 43). Winograd (2003) posited the notion of display rules in teaching, whereby teachers believe that emotions such as enthusiasm, consistency, avoiding extremes and a sense of humour are important to maintain. Teachers may 'deep act' or 'surface act' to maintain these emotions, even if they feel something quite different (Morris et al., 1996), and it is this labour that can take a toll, either by faking/masking emotions, or trying to feel a more positive

emotion (Brotheridge et al., 2002). Isenbarger & Zemblayas (2006) criticised this notion, arguing that teaching is a rewarding and meaningful job and that there are positive aspects to emotional labour, and Nias (1996) observed that teachers' investment in their roles often forms an inherent part of their identity, which makes it hard to distinguish between the personal and professional self.

Emotion regulation has a broader remit than emotional labour and can be defined as 'the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions' (Gross, 1998, p. 275). The literature revealed many ways in which teachers may regulate their emotions.

Sutton (2004) carried out semi-structured interviews with 30 middle grade teachers in the USA to explore their goals and strategies for self-regulation. The teachers all believed that regulating their emotions increased their teaching effectiveness and enabled them to embody how they felt a teacher should act. They found teachers used a wide range of regulation strategies that could be categorised into modifying situations (lesson preparation, telling students they didn't feel well, choosing a quiet activity), attention deployment (self-talk, speaking with colleagues, ignoring), cognitive change (self-talk), and responsive strategies (deep breath, physically withdrawing, reflection, holding it in).

Burić & Macuka (2017) developed this further and carried out a three-phase empirical study with 945 Croatian teachers to explore their emotion regulation strategies with an aim of developing a Teacher Emotion Regulation Strategies scale. They found the most frequently mentioned emotions were joy, satisfaction, pride, exhaustion, anger, frustration, hopelessness, anxiety and disappointment, and most of the self-regulation strategies were deployed to address the negative emotions. The strategies they discovered could be categorised into what Gross (1998) labelled 'antecedent-focused' (prior to an event) and 'response-focused' (in response to an event):

Antecedent-focused self-regulation strategies	Response-focused self-regulation strategies
Avoiding the situation: avoiding interactions, stepping back	Suppression: repressing thoughts, ignoring feelings
Active modification strategy: adapting teaching techniques and methods	Immediate tension reduction: deep breathing, muscle relaxation
Attentional deployment: fantasising	Venting: talking about work issues, crying
Reappraisal: positive thinking, reframing	Other nonspecific strategies: socialising, hobbies, exercise

I was interested to explore the impact (if any) of the menstrual cycle on teachers' emotions, and if there was any impact, whether a coaching intervention might help.

3. The Research

The intervention took place in two phases; Phase 1 of the intervention began with exploring the teachers' individual experiences of their menstrual cycle and the ways it may impact on their practice in order, in Phase 2 (section 4), to design a coaching intervention based on the participants' specific needs.

For the reconnaissance phase, I took a phenomenological approach (Farrell, 2020) to explore the ways in which the menstrual cycle may impact three teachers' practice; Sienna, Belinda and Anya (pseudonyms). My initial research question was:

RQ1: In what ways (if any) does a teachers' menstrual cycle impact areas of their work?

Following analysis, there were two key themes that arose; the impact of the premenstrual phase on areas of teaching practice, and beliefs about how teachers should manage the emotional impact of their menstrual cycles in schools.

There was evidence that the menstrual cycle impacted specific areas of practice for Belinda and Sienna (student interactions, planning and assessment). Anya was more cautious in attributing emotional challenges to her menstrual cycle. All three participants reported feeling more irritated by student behaviour during their premenstrual phase. There was evidence that the participants felt teachers should be calm, consistent and positive, and Belinda in particular felt that demonstrating emotions that differed from this would result in negative consequences. There was evidence of emotional labour for Belinda and Sienna, which I knew from the literature review could have an impact on teacher practice by adversely affecting well-being (Brotheridge et al., 2002).

Linked to the themes that emerged in Phase 1, I set about developing a coaching intervention that aimed to support participants to develop an area of practice they identified. I decided to use Korthagen's (2014) Core Phase Model of Reflection as the framework for the coaching intervention, because I felt it would allow me to explore specific teaching episodes (gestalts) but also enable teachers to reflect on their wider beliefs (through the 'elevator'):

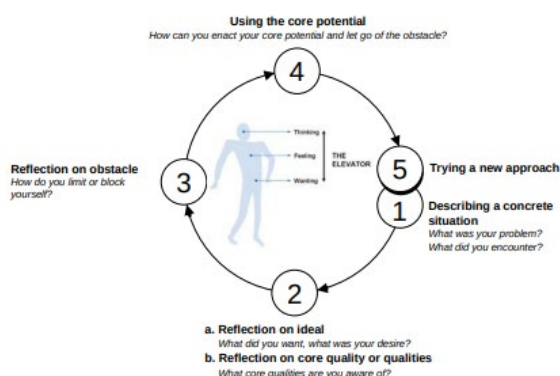


Figure 2: The Core Phase Model (Korthagen, 2014)

My next research questions were:

RQ2 (linked to Theme 1): In what ways can a coaching intervention support participants to identify and achieve a goal related to an area of their practice and their menstrual cycle?

RQ3 (linked to Theme 2): In what ways can a coaching intervention impact participants' beliefs about how teachers should manage the emotional impact of their menstrual cycles?

The coaching intervention consisted of a range of collaborative sessions, 1-2-1 coaching conversations and activities that were designed to encourage progress towards a goal through reflection and were rooted in the teacher education literature. These sessions acted as both the intervention, and data collection, in order for me to analyse and evaluate the impact of the coaching intervention.

All participants were able to establish a goal that related to their menstrual cycle and teaching practice, which was an element of RQ2. The other part of RQ2 related to the impact of a coaching intervention on developing an area of practice. The coaching intervention led to a range of outcomes for participants. Anya and Sienna reported a change in practice, such as changing the way they approached planning and assessment, or reappraising situations during the premenstrual phase. This was consistent with antecedent-focused emotion regulation strategies (Burić & Macuka, 2017) and there was some limited evidence that those participants experienced less emotional labour (Hoschild, 1983) as a result. This aligned with research that suggested antecedent-focused strategies have a more positive impact on well-being and motivation (Burić, 2019). Belinda reported a change in awareness and acceptance of the emotions associated with her menstrual cycle, and

despite continuing to surface act, experienced less emotional labour (Hoschild, 1983) as a result.

Belinda and Anya experienced a change in beliefs about how the emotions associated with the menstrual cycle should be managed in teaching. Belinda articulated an ideal based on this shift in beliefs, whereas Anya felt there should be changes in teacher education programmes. Sienna's beliefs did not change significantly, but she did make changes to her practice that embodied her existing beliefs. There was strong evidence that the teachers believed emotions should be positive and consistent in teaching (Becker et al., 2014) and that there were display rules associated with showing emotions in school. It was interesting to note the intersection between the teacher's emotion and menstrual cycle literature, as these display rules were very similar to those expected according to concepts such as menstrual etiquette (Law, 1990) and blood work (Grandey et al., 2020).

It was more challenging to establish specific ways in which the elements of the coaching intervention had an impact. There was a common theme that all participants experienced increased awareness of their menstrual cycle, which they found helpful. Therefore, exploring teachers' individual experiences through reflection would form part of my recommendations (discussed below). Elements of the Core Phase Model (Korthagen, 2014) were also helpful in eliciting reflection that led to progress towards participants' goals. For example, by discussing specific gestalts, Anya was able to uncover the emotional impact of her menstrual cycle more clearly. By exploring her thoughts, feelings and desires, Belinda was able to articulate an ideal scenario for managing her menstrual cycle that she would not have considered during Phase 1. Whether it was a particular element of the intervention or the combined effect of the sessions was not clear, and would need to form the basis of a further study.

4. Limitations

There were some significant limitations to this study. Firstly, the sample size was very small, and therefore any conclusions drawn cannot be applied more generally. Secondly, the use of qualitative data, and the absence of any quantitative mechanism for measuring emotions were limitations to the validity of the findings. Thirdly, as an interviewer, there were many moments I wish I had probed further into certain points that were raised in the coaching sessions. Specifically, I could have asked more questions about the specific impact of each element of the coaching intervention to establish this with more confidence. Finally, I had a technical issue recording one of the final conversations with Sienna which meant limited conclusions could be drawn from this.

5. Implications for Teacher Education

To provide clear recommendations to the teacher education sector, I produced the model in Figure 7, which incorporates the findings from this study into Chen's (2021) Teacher Emotional model. It was designed so that teacher educators can work through points one to five as part of a coaching intervention that supports reflection and emotion regulation for menstruators in schools.

Point one was designed to capture a teacher's experience of their menstrual cycle in the workplace. Whilst Phase 1 was not initially part of the intervention, it was pivotal in enhancing awareness of the impact of the menstrual cycle on participants' practice. Once this essential context had been established, and any emotional impacts of the menstrual cycle revealed, point two would then be incorporated.

Point two focuses on exploring teachers' beliefs about how they should manage their menstrual cycle in school. Teachers' beliefs are complex and fundamental (Pajares, 1992), and in line with

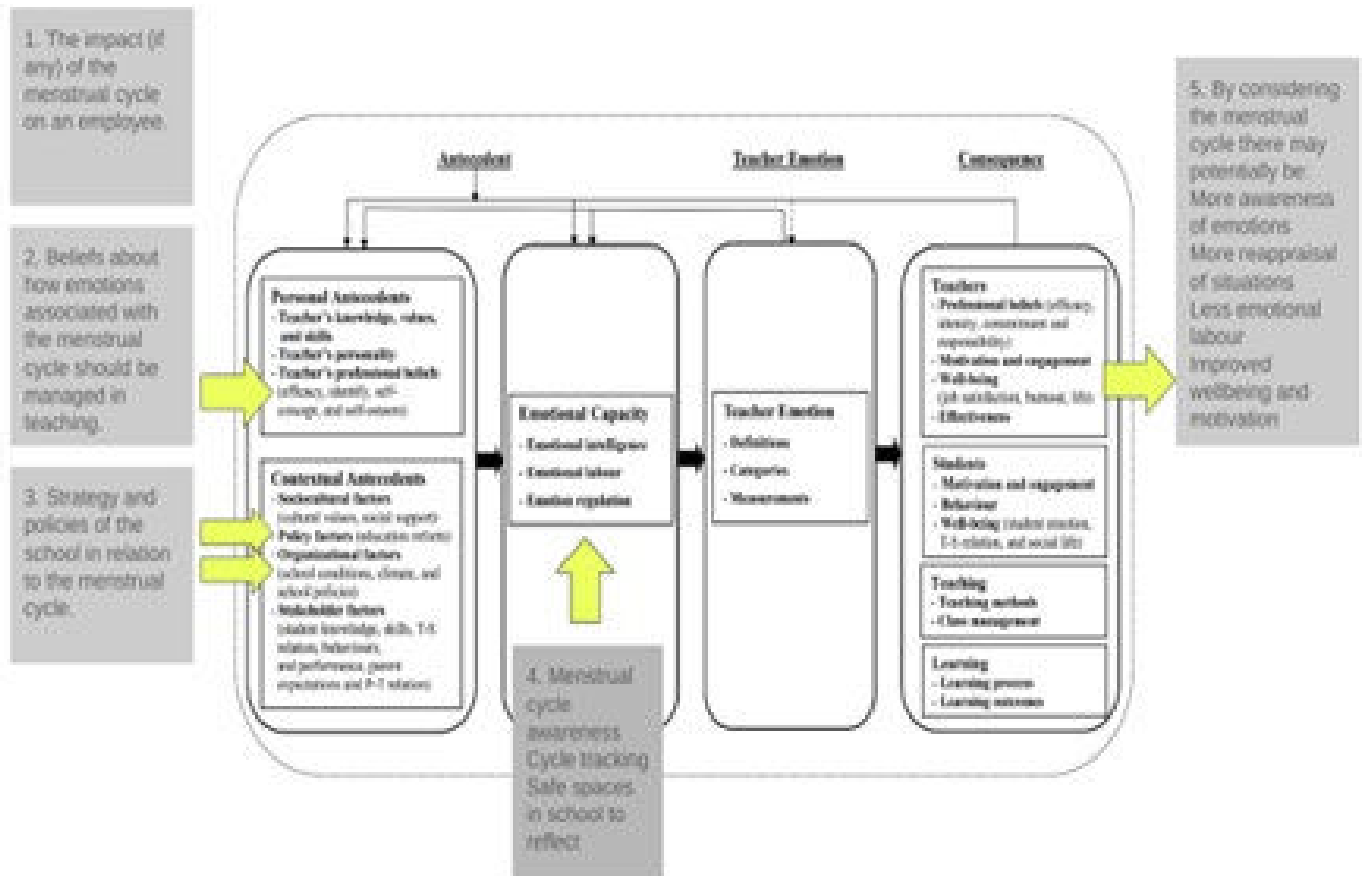


Figure 3: Adapted Teacher Emotion Model

Chen's (2021) model, are a powerful antecedent to emotions. There would be little point in reflecting on practice without exploring underlying beliefs, and the menstrual cycle literature suggests that menstruation remains a stigmatised and shameful topic. By exploring this in tandem with reflection on practice, there would be greater potential for lasting change on emotion regulation and emotional labour.

Point three was designed to empower women to think about how their workplaces could be more accommodating of their menstrual cycle. Zemblayas's (2003) writings about safe spaces in schools for teachers to challenge the social rules was relevant when designing this point.

Once antecedents have been explored through points one to three in relation to the menstrual cycle, point four focuses on empowering individuals to become more aware of their menstrual cycles (through reflection, discussion and tracking their cycle) to develop their capacity

to manage their emotions positively.

Finally, by incorporating the menstrual cycle into Chen's (2021) model, it is hoped that teachers will experience outcomes such as decreased emotional labour and more effective emotion regulation, as highlighted in point five.

Whilst this model aimed to provide a guide for teacher educators working with menstruators, it is important to note that all stakeholders within the school community can be included in these discussions; those involved with leadership, students and other stakeholders, whether they experience a menstrual cycle or not. By involving everyone, there is more chance of workplaces becoming more adaptable and responding better to the needs of menstruators.

Despite feeling overwhelmed at how I could do justice to the women who shared their experiences with me, I felt privileged to have witnessed the journeys they have been on. I

Periods and Pedagogy: The impact of the menstrual cycle on teachers' emotions and the effectiveness of a coaching intervention

Rationale: Place the menstrual cycle (and women's health more broadly) firmly into research agendas. Shame and stigma remain associated with the menstrual cycle and can impact all areas of women's and girls' rights (United Nations, 2019). Teacher emotions impact many aspects of practice such as wellbeing, motivation and interactions with students (Chen, 2021). Scope to explore this further in education.

Literature review:
Key concepts that emerged from the menstrual cycle literature were menstrual etiquette (Law, 1990), institutional non-acceptance (Young, 2005) and 'blood work' (Grandey et al., 2020). All relate to the secrecy, shame and pain women can experience managing menstruation in the workplace.
Key concepts from teacher emotion literature were emotional labour (Hochschild, 1983), emotion regulation: surface and deep acting (Brotheridge et al., 2002). Zemblayas (2003) wrote about the importance of 'spaces of resistance' for women.

The Coaching Intervention

Group Session 1: 'Episteme' (Korthagen, 2014) input from me about menstrual cycle awareness. Group discussion, reflection and creation of goal.
Individual coaching sessions: Participants had x2 sessions at weeks 5 and 10 to discuss progress towards goal. Korthagen's (2014) Core Phase Model used as the coaching framework. Final group reflective discussion: Safe and supportive space for participants to have final collaborative reflections (Zemblayas, 2003).

Implications for Teacher Education

Inclusion of menstrual related education for all stakeholders within Professional Development Curriculums

Provision of safe spaces for women and menstruators to come together in school and discuss and share their experiences of menstruation, perimenopause and post-menopause

Creation of coaching programmes to work with women and menstruators in schools to empower them to manage the emotional impacts of their menstrual cycle

Phase 1: Exploratory study (Farrell, 2020)
RQ1: In what ways (if any) does a teachers' menstrual cycle impact areas of their work?
Methodology: Semi-structured interviews (Thomas, 2017) with three participants (Belinda, Sienna and Anya - pseudonyms). Transcripts coded deductively using Weok et al's (2023) categorisation of menstrual cycle phases. Then coded inductively to distill key themes (Menter et al., 2011).

Findings - Theme 1: Menstrual cycle impacted on planning, assessment and interactions with students. E.g. during premenstrual phase, quicker to issue detentions.

Findings - Theme 2: Teachers held beliefs about how they should manage their menstrual cycle in school. E.g. must always show emotions in line with display rules (Winograd, 2023).

Phase 2: The Coaching Intervention
RQ2: In what ways can a coaching intervention support participants to identify and achieve a goal related to an area of their practice and their menstrual cycle?

RQ3: In what ways can a coaching intervention impact participants' beliefs about how teachers should manage the emotional impact of their menstrual cycles?

Methodology: Transcripts from coaching sessions coded deductively using the RQs as evaluation framework. Written comments from group discussions analysed.

Findings - Theme 1: Belinda increased awareness which reduced her emotional labour. Sienna adapted her long term planning. Anya reappraised challenging situations with students.

Findings - Theme 2: Belinda articulated an idea whereby she asked colleagues for support. Sienna introduced menstrual cycle awareness to her team. Anya believed teachers could be more open about how they feel.

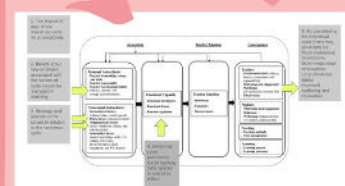


Figure 1: Chen's (2021) Teacher Emotion Model adapted to include menstrual cycle recommendations

Personal Implications

In my own practice as a teacher educator, I plan to incorporate the menstrual cycle into the ways I work with colleagues in a number of capacities in school. For example, I am an ECT mentor and would like to include this work into the coaching process with female ECTs, working either individually or as a group to support them to feel more empowered to manage their menstrual cycles at work. I am also part of a middle leader network and an associate SLT. I would like to deliver a session about menstrual cycle awareness to all staff, and give them opportunities to reflect on how this knowledge might impact their practice. For example, a male teacher may have more understanding and empathy of female students they teach as a result which could reduce detentions. I would also like to complete another cycle of intervention similar to this project, to further refine the coaching intervention (Lewis, 1946). I am grateful to my school's leadership team, particularly the Headteacher, who have been so supportive of my work and open to making space for menstrual cycle awareness on the teacher development agenda in the future.

Figure 4: Summary of the Research & Development Project

I learnt so much from listening to the voices of other women and felt honoured to have had the opportunity to develop a coaching intervention that impacted them in the ways it did. I now hope to see more research in this area, including quantitative studies, larger scale studies, and research that explores different elements of the themes that arose during this assignment, such as teacher beliefs. This study contributed to the knowledge base on the impact of the menstrual cycle in teaching, and I look forward to seeing how this field evolves.

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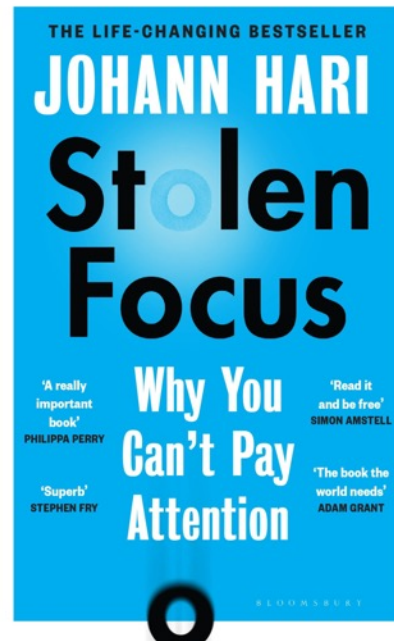


Book Reviews

Stolen Focus: Why You Can't Pay Attention- -And How to Think Deeply Again (2022) by Johann Hari

Reviewed by Charlotte Hawes

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If you read one book this year, read this one. The first chapters are a somewhat frustrating read as the author describes what sounds like a glorious digital detox: a sustained time away from all tech—a break accessible only to a very small and privileged minority! However, read on for the remarkable insights and wisdom that stem from this experience, combined with much broader research. The collective ability of humans to retain focus for a sustained period has been eroded over the past decades, as we are bombarded with ever more information demanding our attention. We feel guilty about our excessive screen time and struggle to help our children avoid the addictive demands of their devices. In many ways, this book alleviates some of that guilt. It explains how, at an individual level, this is not entirely our fault, instead pointing the finger at social media organisations and the lack of legislation around the algorithms designed to keep our eyeballs glued to screens for as many hours a day as possible. It's alarming, but in this case, knowledge really is power. Understanding what is happening equips us with tools to better manage and tackle this problem.

The book starts by outlining the attention crisis, characterised by people feeling overwhelmed and distracted, before examining the role of technology in causing this. The fire hydrant

analogy really stuck with me: Hari uses the idea of water flow to illustrate how the volume and speed of information we receive have changed dramatically. Historically, information came through a small pipe; it was manageable, and we could process and absorb it. Nowadays, we are flooded with a “**fire hydrant of information**,” which is overwhelming. We cannot filter or prioritise, so we are drowning in information that we can only process at a very superficial level. The endless stream of information prevents deep and meaningful focus, instead leading to anxiety and distractibility. To reclaim our focus, we need to manage the “**water flow**,” creating an intentional relationship with information.

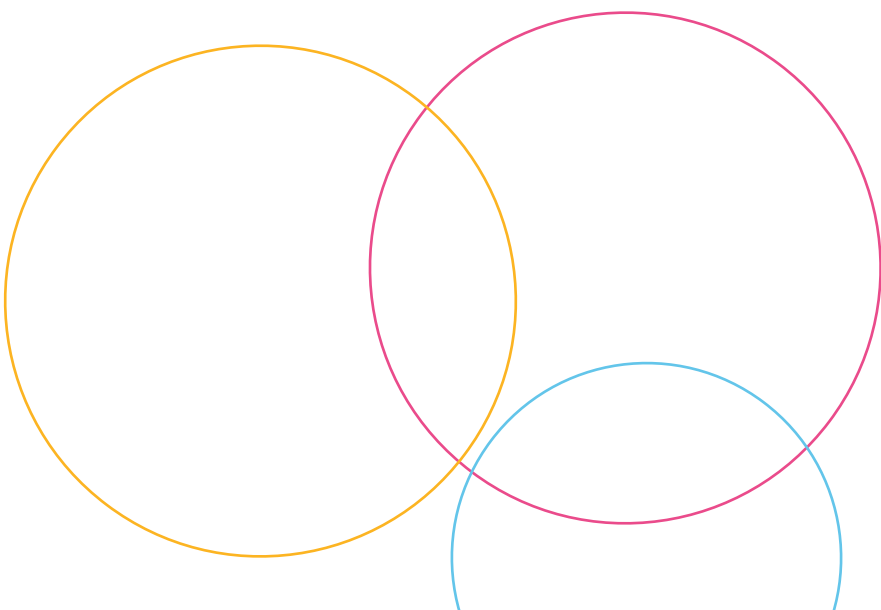
Societal pressures and personal well-being are also explored before the much-needed section on solutions to these problems. These include setting boundaries with technology (the school's new policy on smartphones could not be more timely), practicing mindfulness, and nurturing meaningful social connections. Finally, Hari calls for collective action, arguing that policy changes are essential and that we should demand them. I agree wholeheartedly with much of what he said and felt empowered by the knowledge gained.

One of the most valuable takeaways for me, which I share with my pupils, was the explanation



of why multitasking is ineffective. Hari cites research showing the cost of switching between tasks: each check of the phone requires us to “reel back” to regain focus and understanding of the task at hand. The costs include seconds spent recovering attention, an increased number of errors, and, over a working day, time and effort wasted. On top of that, frequent task-switching leads to increased mental fatigue, heightened stress, and decreased motivation. Insights like this are invaluable in helping pupils see the tangible benefits of reducing phone use—or even keeping their phones in a different room while working.

This book will challenge and alarm you, but ultimately, it will improve your life in meaningful ways.



Mindset: The New Psychology of Success (2006) by Carol S. Dweck

Reviewed by Amy Mistry

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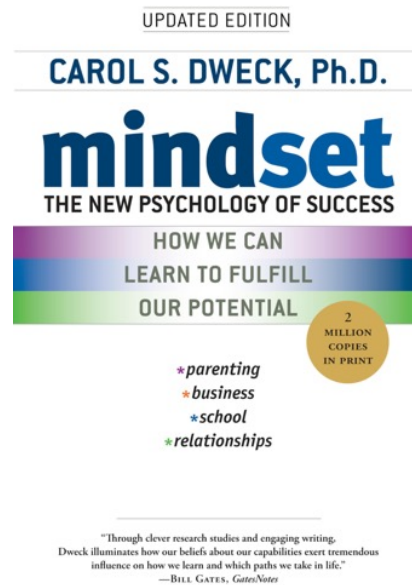
As a maths teacher and a mum to three young children, I found *Mindset* by Carol Dweck to be incredibly insightful. The central concept of the book—that people operate with either a “fixed mindset” or a “growth mindset”—isn’t new to me, but it was certainly brought to life through many examples in this book. I have observed these two mindsets among my students and, if I’m honest, in myself as well.

The fixed mindset is the belief that our abilities are set in stone: you’re either good at something or you’re not. I’ve witnessed this in students who shy away from challenges because they fear failing. They’ve internalised the idea that effort means they’re not naturally gifted at something, and therefore it’s not for them. Mistakes further compound this feeling—mistakes feel like proof they’re not good enough. Nowhere is this more apparent than in maths, where there are endless chances to get things wrong. In contrast, the growth mindset encourages us to view abilities as things we can develop through effort, persistence, and learning. The idea that “talent alone doesn’t determine success—hard work and resilience do” aligns closely with the four R’s of UCS’s learning culture.

Dweck’s work has prompted me to reconsider how I engage with my students. I’ve always wanted to boost their confidence, but I now realise that praising them for getting an answer correct isn’t the best approach, as it can trap them in a fixed mindset. This makes them afraid to challenge themselves for fear of getting the answer wrong. Instead, I now focus on praising the process—effort, persistence, and the strategies they use—so they associate success with hard work rather than innate ability.

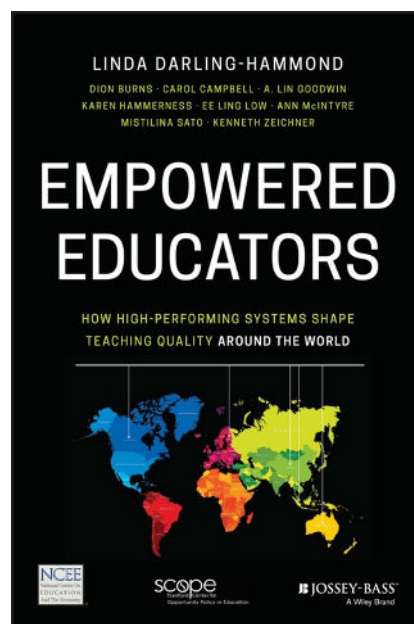
In *Mindset*, Dweck also highlights how early mindset formation influences future success, not just in school but in relationships, careers, and personal development. Encouraging a growth mindset in children equips them to face life’s inevitable challenges with resilience and a sense of possibility. This is something I aspire to foster in both my students and my own children.

In conclusion, *Mindset* is a must-read for anyone who is keen to foster perseverance and a love of learning in young minds.



Empowered Educators: How High-Performing Systems Shape Teaching Quality Around the World (2017) by Linda Darling- Hammond and others.

Reviewed by Helena Yovichich



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Empowering Educators by Linda Darling-Hammond is an insightful and thorough investigation into the policies, societal attitudes, and practices of countries where students excel within the education system. The book focuses on five countries: China, Australia, Canada, Singapore, and Finland. What is particularly interesting is how many of the practices discussed are also present in the UK. However, it is often the rigorous application of these practices and the conscious follow-up surrounding them that sets these countries apart, enabling them to flourish.

One compelling example is how many top-performing countries have subject-focused networks where best practices in, for example, geography, are shared between schools within a district. Another striking point—though one that cannot be addressed by teachers or individual schools alone—is the perception of teaching as a highly regarded profession in successful countries. In Australia, for instance, teachers' salaries are now equivalent to those of many lawyers and other comparable professions, leading to a positive shift in the perception of teaching as a career. In Finland and Singapore, teaching is a highly competitive and respected profession. This competition not only drives standards but also increases the pool of potential candidates.

The book is significant in its scope, examining everything from equity in teaching practices and

differences in curriculum control to the rigorous selection of trainee teachers. In some areas, such as teacher training, the UK would likely compare favourably. In other aspects, however, it is clear that work remains to be done.

This book provides valuable insights at the national or jurisdictional level, showing how governments and societies can progress their education systems to enable students to thrive in modern society. However, it does not offer practical steps for individual teachers or, in some areas, for individual schools. What it does offer is a deeper understanding of the structures and priorities that enable educational success—essential reading for those interested in the development of teaching priorities at a school-wide level.

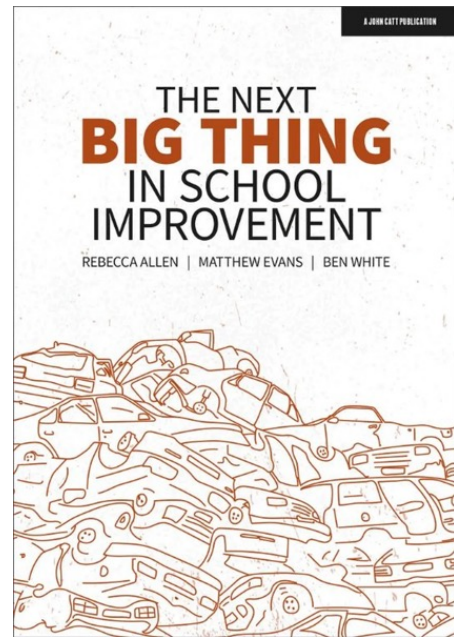
Continuous learning and professional development emerge as key aspects of successful education systems, particularly in China and Singapore. Unsurprisingly, these are not viewed as optional but are given dedicated time throughout the year. Often conducted in groups and across schools, this collaborative approach allows for broader pedagogical research.

Overall, *Empowering Educators* presents many interesting and thoroughly evidenced concepts that, if implemented effectively, could lead to clear gains for both students and staff.

The Next Big Thing in School Improvement (2021) by Rebecca Allen, Matthew Evans, Ben White

Reviewed by Scholar GTP

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The Next Big Thing in School Improvement by Rebecca Allen, Matthew Evans, and Ben White is a critical examination of modern educational reform efforts, aimed at educators and school leaders looking for practical, evidence-based strategies to enhance student outcomes. The book pushes back against the allure of trendy, yet unproven educational interventions, advocating for sustainable, research-informed practices that prioritise long-term benefits over quick fixes.

Central Thesis

The authors argue that many contemporary school improvement initiatives are superficial, driven by trends rather than solid evidence. Schools are often caught in a cycle of adopting flashy programs that promise quick success but fail to deliver meaningful, lasting impact. Allen, Evans, and White propose a more cautious, evidence-based approach that respects the professional judgement of teachers and acknowledges the complexities of the classroom environment. They believe that sustainable school reform should empower educators, valuing their insights and promoting practices that genuinely benefit students over time.

The book is divided into three sections:

- 1. Critique of Current Trends:** The authors highlight the pitfalls of contemporary school reform, particularly the obsession with new initiatives—referred to as “initiativitis.” Schools are pressured to implement new programs and technologies frequently, many of which are based on weak evidence. This trend often leads to wasted resources and teacher burnout, detracting from the real work of improving student learning.
- 2. Misuse of Data:** While data-driven decision-making is popular in education, Allen, Evans, and White caution against over-reliance on quantitative metrics. They argue that reducing complex educational outcomes to mere numbers can mislead school leaders and educators, leading to misguided decisions. The book encourages teachers to balance data with professional judgement and qualitative insights, reinforcing the value of their expertise in understanding students’ needs.
- 3. Empowering Educators:** The authors advocate for teacher autonomy and professional development as key drivers of effective school improvement. They call for a culture that supports teacher collaboration, reflective practice, and continuous learning. This approach not only enhances teacher satisfaction but also leads to

better educational outcomes, as teachers who feel empowered are more likely to implement thoughtful, evidence-based strategies.

Key Takeaways for Educators

One of the book's major strengths is its focus on practical advice for teachers navigating the complex landscape of educational reform. The authors provide strategies for evaluating new initiatives, encouraging educators to ask critical questions about the evidence supporting any new program before implementing it. This helps teachers protect their time and energy from being wasted on ineffective practices.

The book also highlights the importance of professional learning communities, where teachers can share experiences, challenges, and best practices. By fostering a supportive network among educators, schools can create a collaborative environment that enhances both teacher and student success. This emphasis on collective efficacy underscores the belief that meaningful school improvement is a shared endeavour.

Critique of the Book

While the book is well-researched and offers a refreshing critique of current school improvement practices, some readers might find its tone somewhat discouraging, especially given the many challenges highlighted. However, the authors ultimately provide a hopeful perspective, emphasising that change is possible when educators are equipped with the right tools and mindset.

Additionally, the book's focus on the UK education system may limit its direct applicability to teachers in other countries. Although the principles discussed are largely universal, some of the examples and policy critiques are specific to the UK context. Nonetheless, the core message—promoting evidence-based, teacher-led reform—is relevant to educators worldwide.

Conclusion

"The Next Big Thing in School Improvement" is an essential read for teachers, school leaders, and policymakers who seek a more thoughtful and sustainable approach to educational reform. It challenges educators to critically evaluate the initiatives they adopt, pushing for a shift towards practices that genuinely support long-term student success. The book's emphasis on teacher empowerment, collaboration, and evidence-based strategies offers a blueprint for meaningful change in schools.

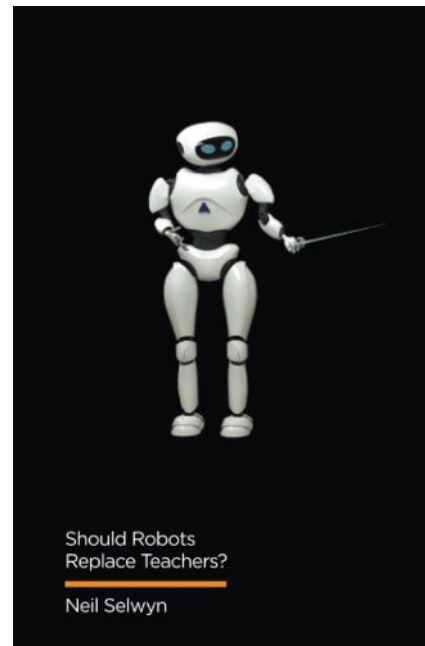
Allen, Evans, and White deliver a compelling critique of the current state of school improvement, encouraging educators to rely on their professional expertise and resist the pressure to chase after the latest educational fad. By focusing on what truly works, the book inspires teachers to take charge of their professional development and advocate for reforms that align with the realities of the classroom.

In an era where schools are under pressure to show immediate results, *The Next Big Thing in School Improvement* stands as a call for a more measured, research-informed approach to teaching and learning. Educators who embrace the book's insights will gain a renewed sense of purpose and be better equipped to implement sustainable improvements that benefit their students in the long run.

Should Robots Replace Teachers?: AI and the Future of Education (2019) by Neil Selwyn

Reviewed by Ben Mace

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A UCS Transitus student is stuck on a particularly fiendish maths question. They raise their hand in the air to ask for support from their teacher. A cyborg detects their need for help, hovers over, assesses the question and the work the student has done so far, and calculates the best way to communicate the perfect amount of information to the student to maximise their personal development.

Unfortunately, for some perhaps, this isn't exactly a large focus of Neil Selwyn's book 'Should Robots Replace Teachers?'. There is a chapter of this bite-sized book which regards the topic of cyborgs / physical robots in classrooms. However, the major focus of the book is the morality, ethics, and rationality behind the concept of various aspects of teaching being replaced, or more realistically, supplemented by various forms of AI.

There's an important distinction made early on in the book regarding the title. It's not '**Could** robots replace teachers?' but '**Should** robots replace teachers?'. Selwyn points out that it is entirely possible that technology will reach a point where the day-to-day tasks of a, say, secondary school teacher, **could** be replaced by a robot. The question is whether it **should** happen. Throughout the book, numerous forms of AI are evaluated, and Selwyn does not appear convinced.

Chapter 1 analyses the current state of AI and teaching. It should be noted that this book is published in 2019, 3 years before ChatGPT was released to the world. I find this interesting as this technology has been a major disruptor in the education industry yet is not mentioned in this book. Selwyn claims that education is the least future focused industry sector and bemoans the fact that most advances in edu-tech come from computer scientists and cognitive psychologists, and are often focused on profit maximisation, rather than being student led services.

Chapter 2 discusses the notion of physical robots in a classroom style setting. The overall sense of the chapter is that the notion of cyborgs walking around a classroom will never happen. Apart from the technological requirements needed for this, the lack of humanity a cyborg would display with regards to i.e. facial expressions, is a potential safeguarding and educational detraction. Japan and Korea have created cyborgs named Saya and Sota respectively, and they are only able to emulate a fraction of human non-verbal cues. Teaching is a profession where hundreds of subconscious, non-verbal cues seamlessly occur daily, which help students feel safe, supported, or understand the nuance of a concept. Cyborgs have a long way to go to rival this.

Chapter 3 moves on from cyborgs to intelligent tutoring and pedagogical assistants. This is certainly a more realistic field for AI to disrupt and the US military and professional training platforms have found a degree of success in this field. In a school setting however, the need for safeguarding and emotional privacy creates a significant challenge for AI tutors. The pedagogical systems are better used behind the scenes as opposed to a primary means of learning. Planning teaching activities and dealing with student enquiries is a more realistic goal for AI tutors.

Chapter 4 analyses technology that is more behind the scenes. Automated essay grading systems in various forms have been trialled to very degrees of success. A major issue with these platforms is that the AI tends to adopt a preferred narrative style or argument structure, which the students could learn to tailor their essays towards. Selwyn also makes a nuanced remark about the nature of many education establishments being serendipitous places; organised chaos which can be fun and exciting for students. It's hard to imagine the AI counterpart in the same light.

Selwyn finishes by concluding that there is a strong argument that teaching will remain a human process. The profession is likely to change in response to AI but the fundamental responsibility is not likely to be transferred to the metallic arms of an all-seeing superbots anytime soon.

Should teachers read this book?

Edited by Adriane Martini

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Neil Selwyn's *Should Robots Replace Teachers?* is an interesting exploration of technology's potential role in education, but it's also a valuable resource for teachers reflecting on the future of their profession. The book provides a balanced and accessible discussion on the ethical, practical, and pedagogical implications of AI in the classroom. For educators, it serves as a reminder of the complexities of teaching—particularly the human nuances that AI struggles to replicate, such as empathy, intuition, and non-verbal communication: the basis of human relationships.

Teachers will find the book especially useful as a starting point for professional discussions on how emerging technologies might support rather than replace their roles. It encourages educators to critically assess not only the benefits of AI-driven tools but also their potential to undermine the core values of education. Selwyn's insights make this book an essential read for those committed to maintaining a human-centered approach to teaching while adapting to the inevitable changes technology will bring.



How Children Succeed: Grit, Curiosity, and the Hidden Power of Character (2013) by Paul Tough

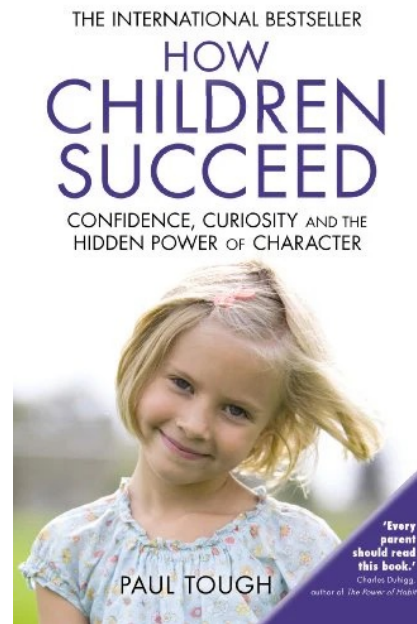
Reviewed by Charlotte Hawes

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This fascinating and very readable book addresses the issue of how we, at both individual and societal levels, can enhance outcomes for young people, also considering what has led to a relative decline in educational standards, notably in the USA, both in historical and international comparisons. The author writes from a North American perspective, and I would advise arming yourself with a basic knowledge of the US education system, at least in terms of year group names, before you embark on this. UCS teachers are well versed in learning different institutions' versions of year group names, so don't let that put you off too much!! In fact, I would highly recommend reading this - the ultimate message is that everyone can and should focus more on helping children develop character rather than exclusively focussing on academic outcomes. I felt this message was very much in line with the school's ethos, and as such found this to be validating (and somewhat vindicating!) read, but more importantly, it provides the ideas and evidence as to how and why we should do that.

The book opens by highlighting the problem with the Cognitive Hypothesis, a traditional core idea in education which can logically lead to drilling pupils on particular skills, at the expense of developing persistence, self confidence, self control, and grit; essential non cognitive skills which have been shown to correlate with a more

fulfilling and successful adult life. The second section discusses the alarming failings in US schools, and presents evidence highlighting the impact of childhood trauma on capacity to manage stress. The neuroendocrinology and stress physiology is explained adeptly, and I found the Firehouse metaphor particularly interesting. The idea is that childhood trauma (e.g. abuse, bereavement), damages the capacity to proportionally and appropriately respond to any stressor; the individual can be left in a state of heightened awareness of all sources of threat or stress, and seemingly small instances cause HPA axis (the stress system) to be activated, in the way that when a fire alarm goes off, all systems from the firehouse respond - a fire truck being sent out for a burnt piece of toast. Case studies are used to great effect to illustrate this, and certainly the insights from a stressed teenage brain are invaluable to the secondary school teacher. The case study of Keitha Jones is both devastating and hopeful, underlining the role of Attachment, and the impact of home life, on capacity to function at school. As one contributor states 'There is a very direct correlation between family issues and what the kids present in school. The lapses in parenting, the dysfunction - it all spills over to the kids, and then they take that to school and the stress and everywhere else' (pg 42-43). As teachers we are aware of this, but the reminder, and description of diverse and complex



challenges some children face, though upsetting, is helpful.

Throughout the book, some key pieces of Psychological research are used effectively, including the 'Lick your rats' research, which suggests that infants need affection. The needs of children as they mature shift, and the author highlights how important it is for middle school aged children to have an analysis of what's wrong, or why something they've done hasn't been successful. Chapter three runs with this theme and is perhaps overly long and highly chess focussed, but ultimately gives the take home message 'grit is crucial, but so is an abundance of rich cultural experience'. Once more, it was satisfying to see empirical evidence supporting the theory, this time it being the value of enrichment.

The fourth section relies on the reader understanding the American education system, and describes some successful interventions that have been introduced in recent years in helping underperforming high school students, in challenging circumstances, get into college. Interestingly, the evidence based key attributes one such leadership course highlighted (Resourcefulness, Resilience, Ambition, Professionalism, Integrity) aligned with the UCS Values, suggesting that hopefully we're on the right track in our aspirations of our pupils.

The final chapter looks at the need to bring together poverty and education if major societal issues which limit the success of young people are to be solved. In line with the findings of TeachFirst, one key part of the puzzle here is high quality teachers, which in my mind underlined the argument that the most valuable asset in education is you, the teacher - an inspiring, motivating, and daunting idea, but one worth reflecting on.

In conclusion I would argue that this is worth your time; it is written primarily for parents but absolutely relevant to educators, and indeed a wider audience; the final message clearly emphasises the role of all members of society in supporting the development of young people. The

five sections are full of well researched theories, and it is well written, engaging, and crammed with compelling (and often tear jerking) stories of the challenges and successes of young people. There is some indulgent prose on remarkable case studies where I'd have welcomed more practical advice, but overall this is a fascinating and compelling read, calling us to prioritise character development over a narrow focus on cognitive success, and realise the crucial role we must have in doing that.





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Hark! Have you really been listening?

By Joe Jones

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Two-tier assessment: sink or swim?

By Darragh Woods

Appendix

Appendix A

ChatGPT Original Conversation available here.

Prompt: I am an A-Level Geography student. Please could you write a paragraph summarising the Demographic Transition Model?

Output: The Demographic Transition Model (DTM) is a theoretical model that describes the changes in population growth over time as a country develops economically. It is divided into five stages. In Stage 1, both birth and death rates are high, leading to slow population growth. This stage represents pre-industrial societies. Stage 2 sees a decline in death rates due to improvements in healthcare, sanitation, and food supply, while birth rates remain high, causing rapid population growth. Stage 3 is marked by a significant decline in birth rates, often due to changes in social norms, family planning, and urbanization, leading to slower population growth. In Stage 4, both birth and death rates are low, resulting in a stable population. Finally, some countries may enter Stage 5, where birth rates fall below death rates, leading to natural population decline unless offset by immigration. The DTM helps explain the

relationship between economic development and demographic change but does not account for all factors, such as migration or government policies.

The text was then inputted into an AI conversion software, AI Text Converter. This gave this following output:

A demographic transition model (DTM) is a theoretical model that describes changes in population growth over time. This is because the economic development of the country is divided into five parts. The first period had higher birth and death rates. This slows down population growth. This stage represents a pre-industrial society. Stage 2 saw death rates decline due to improvements in health care, sanitation, and food, while birth rates remained high. As a result, the population is growing rapidly. The birth rate in stage 3 decreased significantly. Often this is due to changes in social norms. family planning and urban expansion As a result, the population will stabilize. Eventually, some countries may enter phase 5, where the birth rate drops below the death rate. As a result, the natural population has decreased. Unless compensated for by immigration, the DTM helps explain the relationship between economic development and demographic change. But it does not take into account all factors such as immigration or government policy.

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Liberal Education: Hirst's misuse of Wittgenstein

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Education for creativity: Enhancing teachers' capacity to foster and develop students' creative qualities in the context of formal education at UCS

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Language-responsive teaching: Improving EAL students' understanding of 3D solids in Mathematics

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The Traumatic Memory Paradox: A Meta-Analysis of PTSD Treatment Modalities through Sleep Deprivation Mitigation

By Ignacio Esclamado Cadenas

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Periods and Pedagogy: The Impact of the Menstrual Cycle on Teachers' Emotions and the Effectiveness of a Coaching Intervention

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