3.4 Creating Desirable Difficulties

Professor Robert Bjork introduced the concept of 'desirable difficulties' in his seminal 1994 work. Since then, it has become a well-known term for many educators. The theory is based on Bjork's concern that many of us believe memory works like a tape or video recorder, with repeated exposure to the same material enabling it to be written into our memory. This belief causes us to go through the same material in the same way many times over in the false belief that this will result in effective learning. It doesn't.

I include the term in this section because all too often, people imagine that challenge equates to increasing the difficulty of content. Generally, this means giving students more information, setting tasks with increased complexity or removing variables such that students have fewer resources on hand with which to solve a problem. These are all valid. Bjork, however, adds other approaches.

Firstly, it is important to note that Bjork does *not* promote the idea that everything difficult will be desirable for learning. There are of course many difficulties that are undesirable, ones that will create barriers to learning. By 'desirable difficulties', he means introducing challenges requiring more effort than normal to 'trigger encoding and retrieval processes.' (Bjork & Bjork, 2011).

From the evidence he has collected, Bjork recommends four main approaches.

3.4.1 Vary The Conditions Of Learning

If all the learning in one domain takes place under standard conditions – for example, same teacher, same teaching style, same classroom, same cadence of lesson structure, same textbook – then the learning is likely to be fixed in that context. This might not be noticeable if later retrieval takes place under the same conditions, but learning loss is likely to be pronounced when the situation changes. This is often why students struggle to apply learning from one subject into another, or from one school to the next.

To mitigate this effect, Bjork recommends varying the conditions at the point of learning. Rather than hoping (or expecting) circumstances to remain constant, we should assume they *will* change. Desirable difficulties therefore mean introducing changes at the point of learning. Add difficulties in now rather than wait until they present themselves uninvited later.

In some ways, this flies in the face of conventional wisdom; we have long assumed that predictability and stability improve learning. We work hard to make classrooms a predictable place with routines, familiarity and fraternity. And this still holds true – which is why Professor Bjork distinguishes between 'ease of learning' and 'success of retrieval'. These two factors it seems are at odds with each other. As one increases, the other decreases. The easier and more readily accessible I make the learning, the less likely my students will remember the lessons learnt when they need to rely on those memories at a later date. The adage of 'easy come, easy go' that I mentioned earlier is appropriate here.

Some of the ways to vary the conditions of learning can include covering the same material with a teacher whose style is very different. For example, a science teacher and a geography teacher swapping classes for a period or two to go over a familiar topic with students from their own vantage points. Or a grade one teacher swapping classes with a grade five teacher for a morning. Other conditions include, moving rooms or learning outside rather than

inside; solving problems that are presented in divergent and novel ways; changing the emphasis or 'big question' that directs the learning (for example, taking a philosophical approach to a maths topic, taking a historical approach to a science experiment, or using drama to explore a content-rich topic); and running revision classes at irregular hours, in different settings with other teachers.

3.4.2 Spaced Versus Massed Practice

Covering a topic in-depth within consecutive lessons is certainly more convenient and conventional than studying some of it now and some of it later. Yet, what is good for organisation is not so good for memory.

Introducing the desirable difficulty of chunking a topic and distributing it across a wider timeframe enhances learning. This is one of the most generalisable and robust effects noted in experimental research on learning and memory. Called the 'spacing effect', it has been demonstrated for all types of materials and tasks – including with animals as well as with humans. Hattie has included five meta-analyses covering 510 studies about spacing in his Visible Learning database. The effect sizes range from $d = 0.27$ to 0.96, with an overall effect of $d = 0.65$. This has the potential to considerably accelerate student learning.
Spacing versus massed practice looks like this. Take a topic. Let's say, you plan to use six lessons to cover it from start to finish. Space this learning by covering 2-3 lessons now, enough that your students have moved from knowing very little to knowing quite a lot. Then begin teaching a second topic, connecting it to prior learning as you would ordinarily. Then some weeks later, return to the first topic to revise what was taught initially and to add extra layers. Take a different pedagogical approach: less direct instruction than you used in the first 2-3 lessons and more problem-solving approaches. Ask your students to create a quiz for each other on the content so far. Then press pause again. Return a few more weeks later for the last lesson. Encourage your students to take a similar approach to revision for exams. 'Little bits and often' is the mantra. Make sure they engage with the material in different ways, with different people, using different types of media, at different times. The desirable difficulty of spacing and variety will lead to longer-lasting learning.

One quick caveat: cramming for exams works! Therefore, the advice in this section should *not* be used to dissuade your students from doing last minute revision for a single subject. However, cramming supports short-term performance only, not long-term retention. So, if they have four weeks to prepare for exams, then spacing out the topics, circling back to them again and again is the way to go. If, however, they have four *hours* before an exam then cramming as much of the same subject as possible into their brains is far more effective for improving performance (although it is likely that this learning will be lost soon after the exam is finished).

3.4.3 Interleaving

Interleaving takes the spacing effect mentioned above one step further. If you are going to teach, for example three, different approaches to solving a problem, analysing examples or developing techniques for accomplishing a skill then instead of teaching A then B then C, you 'interleave' each one such that *part* of A is studied, closely followed by *part* of B and *part* of C. Then, you return to A to study more of that, followed immediately by another part of B and another part of C, and so on.

Sounds like an organisational nightmare and maybe not so 'desirable' for us, the instructors! However, Bjork's evidence is strong: interleaving improves long-term retention and transfer of skills.

Some of the more interesting experiments are as follows. A 'pinball' experiment in which participants learnt three ways to knock down hinged barriers on a pinball-like apparatus in a prescribed order. Everyone made attempts to successfully complete the task. The 'blocked' group practised one pattern at a time – six attempts with the first followed by six attempts with the second and then six with the third approach. The 'interleaved' group had to practise the patterns in a randomly determined order. Interestingly, the blocked group improved their techniques more rapidly than the interleaved / random group. However, when ten days later, both groups were re-tested, the interleaved group performed far better.
In a maths experiment, participants were asked to learn formulas for calculating the volumes of different solids such as a truncated cone. The blocked group performed slightly better on a test immediately after the experiment, but the interleaved group performed significantly better on a delayed test. The difference was striking. The interleaved group scored 63% on a test one week later compared to just 20% for the blocked group (Rohrer & Taylor, 2007).

In an art-based experiment, participants were asked to learn the styles of 12 artists based on a sample of six paintings by each artist. The blocked group studied all six paintings of one artist then moved onto the second artist's paintings and then the third and so on. The order in which the interleaved group studied the paintings was randomly generated, with paintings from any of the six artists clustered together. The results were surprising because not only did the art teachers involved in the experiment assume it would be easier to note the common characteristics of an artist's paintings by grouping them together, but also the students were more confident following the blocked approach. However, the interleaving group were able to far more accurately identify which painting belonged to which artist in a later test. They could also talk more in-depth about the similarities and differences between paintings and between artists.

The reason why interleaving improves encoding (and is therefore a desirable difficulty) is still open to interpretation. One theory suggests that the 'interference' caused by studying different things at the same time forces learners to notice similarities and differences. This leads to higher order thinking which in turn, leads to higher order encoding. Another theory is that interleaving causes 're-loading'. That is to say, instead of studying A then B then C, interleaving involves studying part of A, part of B, part of C, then adding a bit more of A which causes students to think back to what they've understood so far and 'reloading' that information.

3.4.4 Generation and Testing

The final category of desirable difficulties that Bjork recommends is 'generation' (generating solutions rather than looking them up) and testing (although very few students think of tests as desirable!). The evidence is clear, generating an answer, solution or procedure creates much longer-lasting effects than looking up an answer or being told by someone else. Indeed, its effect rivals the spacing effect for generality and significance for learning. When guiding students through the Learning Pit, I call this the 'eureka' effect (see Section 3.8.3.6)

Closely related to generation is testing. Although it suffers from a negative reputation due to its use in high-stakes assessment, when tests are used as a learning event, they are

considerably more effective in the long term than reading material over and over again. Research shows this is true even when no corrective feedback is offered, although with it, it is even more effective. This is when testing becomes formative (see Section 4.6).

Two other benefits of testing should be noted. Firstly, tests can have a metacognitive benefit when used to identify what has and has not been understood. Re-reading a chapter or set of revision notes cannot do this. Tests test understanding much more effectively.

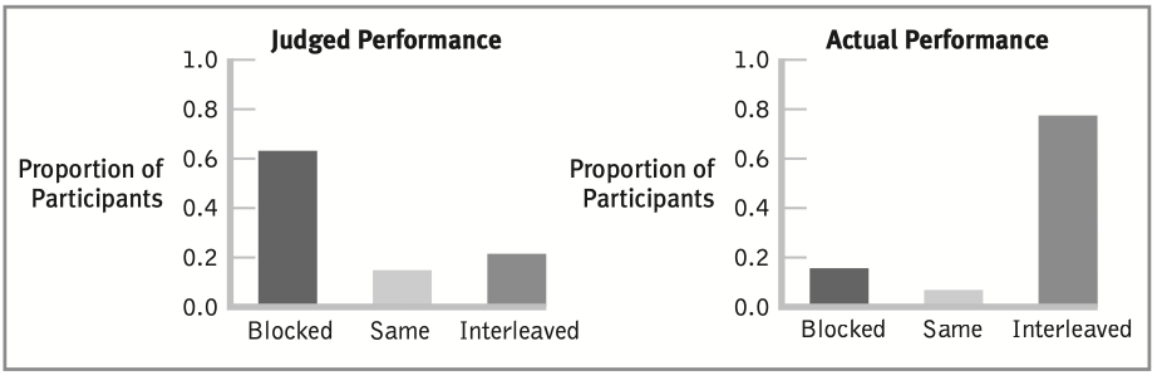
Secondly, tests can (and should) lead to adapted instruction. As I describe in Sections 4.6 and 5.5.2, when the results from testing are used to adjust what or how something is taught next, then benefits are intensified. This is when results are viewed as feedback to teachers even more than feedback to students.

It is worth noting with all desirable difficulties, that there is a marked difference between what *appears* to be optimal learning and what actually results in improved retention, recall and transfer. Bjork's research illustrates that good performance during learning episodes tends to be mistaken for good learning when in fact, later retrieval shows this is not the case.

The fact is that conditions of learning that make performance improve rapidly often fail to support long-term retention and transfer, whereas conditions that create challenges and slow the rate of apparent learning tend to optimise long-term retention and transfer.

I'd like to finish this section with a clear illustration of the differences between learning confidence and learning outcomes. The left panel in Figure 23 shows the proportion of participants who selected blocked, interleaved or same in response to the question: 'Under which condition do you believe you learned better?' The right panel shows the actual performance of the participants in blocked learning and interleaved learning. In this graph, 'same' represents the participants who scored the same irrespective of whether they learnt in a blocked or interleaved manner.

Figure 23: Differences in Perceived Performance Compared to Actual Performance



3.5 Setting Appropriately Challenging Goals

The third way in which challenge is examined in research experiments is through the setting of appropriately challenging goals. As previously noted, challenge should be at the edge of competence: not so hard that students are discouraged but not so easy that they grow bored. Kidd et al (2012) called this sweet spot the 'Goldilocks zone'.

An interesting development in this field is that Wilson et al (2019) have calculated the optimal accuracy for training is around 80 to 85%. They show theoretically that studying at this optimal level can lead to exponential improvements in the rate of learning.

For those of us in the classroom, this can be a useful guide. It means we should be designing learning activities for our students in which, even when they marshal all their personal and intellectual resources, they should only be able to succeed with 80-85% of the task. Thereafter, they should require inspiration or suggestion from others (either you or their peers).

It is important to note, however, that I am *not* suggesting that it should be impossible for students to succeed with one hundred per cent of a task! Context is crucial. In a *learning* situation – one in which you want to stretch your students' capabilities so that they will eventually grow to meet those demands later – then the 80-20 split is a very useful guide. When they are taking an assessment or taking part in an observed performance, then it would be delightful if they could score 100%.

Here's a story to illustrate the point. The first time I took my son to see our local team play, he asked about the purpose of the coin toss before the game began. I explained that whoever wins, chooses the direction of play in the first half. He asked why this was important, so I drew attention to the slope on the pitch (our local ground has dubious pleasure of including the steepest slope of any pitch used by professional teams in the UK). I said, "Son! Look at the pitch. Which way would you want to be kicking in the second half when your legs are tired?" He considered this for a moment and replied, "Uphill, Dad." "Why?' says I. "Because challenge is good, isn't it, Dad?"
This poor boy! He'd suffered my pedagogical theories so much that he was now in danger of being brainwashed! So, I explained to him that, *when it comes to training*, he was absolutely right: challenge is good. But when it comes to matchday, our team needs all the advantages they can lay their boots on. Indeed, the very next season they were relegated out of the football league altogether – so advantage was even more important to them than most.

So, when it comes to training – or learning – situations, then the 80-20 principle applies brilliantly. Set challenges such that even when your students – or in this case, your team – put in every skill and effort they can, they still only achieve about 80-85% of their goal. The other 15-20% should come from additional direction, instruction, suggestion and encouragement.

However, when it comes to a situation in which performance has to be at its very best – in exams, during performances, when playing your local rivals – then getting as close to 100% as possible should very definitely be the goal.

As the saying in sport goes, train hard so that you can play easy.

I would love for every lesson to be challenging enough that sitting an assessment in the exam hall feels straightforward; for every practice or dress rehearsal to make performances feel easy by comparison. In Section 1.3, I gave three examples to show how important context is. These were: making mistakes can be instructional (at the right time); going into the Learning Pit can deepen learning (at the right time); and dialogue can significantly improve learning (when used at the right time).

I am now adding a fourth example: the appropriate level of challenge is somewhere in the region of 80-85% attainable and 15-20% out of reach … but *only when the time is right*. When your purpose is to stretch your students so that they are out of their comfort zone, then the 80-20 split is optimum. If, however, your purpose is assessment or performance, then hope your students will remember everything you've taught them so that they go ahead and ace the test!

Now that that important distinction is made, let's return to the 80-20 guidance.

If you have students getting close to 100% on every *learning* task and or assignment you set, then there is a good chance it is too easy for them; conversely, if some students never get close to an 80-85% success rate, then the challenge is probably too high. These targets may need adjusting according to context. For example, they are likely to fit well with closed-answer situations (such as a spellings or maths learning tasks) but less well with open-ended subjects such as those within humanities and languages. Nonetheless, the principle is a sound one: a marker of challenge is that students should be able to succeed with most – but not all – of a task. If they are acing it, then there isn't enough challenge for them. If they get nowhere close every time, then it is too challenging.

It is also worth adding that these figures shouldn't be seen as the target for attempt one. So, if for example, we expect students to make three* attempts at a given task then they should be close to 85% accuracy after their second or third attempt. (*I say three attempts as it fits with the *Seven Steps to Feedback* that I've shared in Section 4.9 in which we should expect attempt one followed by peer feedback; attempt two followed by teacher feedback; and then attempt three).

Interestingly, interview-based analyses of the enjoyment of intrinsically motivated, goal-directed activities such as chess or rock-climbing show that the optimal level of challenge is a 20% chance of winning or succeeding (Abuhamdeh & Csikszentmihalyi, 2012). So, perhaps the balance between achievable and challenging is different in every circumstance (and for every student). However, what the ratios have in common is that they are never 100% one way and 0% the other. Learning tasks should always include demands that students will not be able to succeed with. That is not to say that they should never attain full marks on a 'performance' task but on a task that is designed for the purposes of learning, then 'appropriately challenging' should include a degree of un-achievability. That is not to say impossible, but to say that right now, at a student's current levels of ability, they are unable to succeed with 100% accuracy.

When we get these levels right, Hattie (2023) calculates the effect size across six meta-analyses involving 375 studies as $d = 0.60$. Bearing in mind the hinge point (see Section 1.8) of 0.40, this represents 50% more learning than normal. Setting appropriately challenging goals is very definitely worth it!

3.5.1 Flow Theory

> Having referenced Mihaly Csikszentmihalyi above, I think it is worth mentioning his theory of 'flow'. He describes flow as a state of deep absorption in an activity that is intrinsically enjoyable, for example when artists or athletes are focused on their play or performance (Csikszentmihalyi, 1990). What makes it important to note is that individuals in this state perceive the activity worth doing for its own sake, even if no further goal is reached (Nakamura & Csikszentmihalyi, 2002). So, although educational research tends to justify challenge as a means to improving learning outcomes, it shouldn't be forgotten that challenge can also be enjoyed for its own sake. Not because it will help me to improve but because I enjoy it. In a school context, we see this when students are following their passions and are entirely immersed in the experience. Not for the purposes of praise or grade, but because it gives them enormous satisfaction.
>
> The flow experience is believed to occur when someone's skills are neither overmatched nor underutilised to meet a given challenge.

> As Csikszentmihalyi describes, "the balance of challenge and skill is fragile; when disrupted, apathy (i.e., low challenges, low skills), anxiety (i.e., high challenges, low skills), or relaxation (i.e., low challenges, high skills) are likely to be experienced." (Csikszentmihalyi, 1997).

3.6 Giving Students Control Over Their Learning

It is a commonly held belief that choice has a positive impact on an individual's feelings, beliefs and behaviour. The term is always used as a positive reference in political slogans, consumer campaigns and, more recently, to attract students to one school instead of another.

Early educational studies showed that choice is a powerful motivator, demonstrating that students are more likely to engage in an activity if they believe they have chosen it (Lewin, 1952). DeCharms (1968) made an even stronger case, claiming that choice is a *necessary* condition for engagement. Later, self-determination theory showed that not only does choice enhance intrinsic motivation, but the opposite is also true; when students perceive conditions are controlling, they disengage (Deci et al., 1989).

Strange then that more recent studies have shown that choice has little to no effect on student motivation or performance (Overskeid & Svartdal, 1996; Parker & Lepper, 1992; Reeve, Nix, & Hamm, 2003). For example, giving students a choice between working on a crossword puzzle or an essay task showed no effect on engagement and task performance (Flowerday & Schraw, 2003).

This effect has concerned me for twenty years. In 2003, I came across the name John Hattie for the first time. He had just published the paper, *Teachers Make a Difference, What is the research evidence?* (Hattie, 2003). I was leading a multi-million-pound social regeneration project at the time. Our budget afforded us many possibilities but brought with it enormous responsibility. No longer could I promote strategies I 'thought' worked well; I had to find those supported by extensive and reliable evidence. Hattie's pre-Visible Learning work was seminal in that regard. As I dug into his work, one connection led to another and very soon, I was voraciously reading anything I could find authored by Hattie. A decade later, I travelled extensively with John as we worked together on projects across Scandinavia. Doing so, I discovered his mind – and humour – is even sharper than his writing. I've never met another nerd who is such good company.

Anyway, I digress (but then, that's my choice! Your choice is whether to read it or not).

In following Hattie's work, I came across the meta-analyses about student choice included in his expanding database. Back then, there were just two meta-analyses, and both related to control over learning in Information and Communication Technology (ICT). However, in 2008 a third meta-analysis was published examining 41 studies about student choice in a wide variety of subjects. Today, there are six meta-analyses covering 226 studies (for example, Carolan, Hutchins, & Wickens, 2014). The overall effect size shocked me: $d = 0.02$. Surely that can't be right, I thought! How on earth can choice *reduce* the effect of learning outcomes?

Choice enhances intrinsic motivation, effort, task performance and perceived competence. We know this from our own experiences as well as from the experimental evidence. So, how can something so positive have such a diminishing effect on learning? The answer lies in its connection to challenge (or lack thereof). Which is why I have included the topic in a chapter about challenge.

I often ask students which of these options they would choose. a) a task they believe they can complete accurately or b) a task that is likely to take them out of their comfort zone and cause them to think. Almost everyone opts for the easier task.

This is not just 'my' students answering. One of the best aspects of my job is taking learning walks around lots of schools all around the world. I find it fascinating, inspiring and thought-provoking in equal measure. Generally speaking, I ask students what they are learning, how much progress they've made and what they plan to do next. I guess these questions will be very familiar to you, particularly if you've already read Sections 4.2, 4.3 and 4.5 in the feedback chapter. Another favourite question is to ask the one above about choice.

When students are given a choice, they typically choose the easier option. This leads to less challenge and lower learning outcomes. This, however, does not mean we should stop giving students choice!

Instead of abandoning choice, we should understand what is happening and why. Then adjust the conditions so that choice leads to more learning, not less.

The insights I have gained to help understand why choice leads to less challenge come from two sources: student voice and research. The first of these is the most important. I ask students to tell me which task they would choose – a (easier) or b (challenging) and then prompt them for their supporting reasons. Figure 24 shows a summary of the responses they give.

Figure 24: Reasons Given by Students About the Choices They Make

EASIER TASK I would pick the task I am confident of completing because …	CHALLENGING TASK I would avoid the task that will take me out of my comfort zone because …
It makes me FEEL CLEVER when I complete the task easily.	I FEEL FRUSTRATED when I can't work out what to do.
TEACHERS PRAISE me when I complete tasks easily.	Teachers tell me to CONCENTRATE MORE if I don't finish tasks quick enough.
I FINISH QUICKER (which means less homework or more playtime).	Challenging tasks might NEVER END
I want to KEEP UP (or, if possible, outperform) my friends.	I might get LEFT BEHIND or look stupid in front of my friends.
It is LESS EFFORT.	I CAN'T BE BOTHERED.

In many ways, these answers say as much, if not more, about the learning culture – what is encouraged, praised or scorned – than they do about the benefits or problems of choice. I recommend ways to change this in the next section. For now, here are some other modifiers mentioned in the meta-analyses.

1. Choice has a positive overall effect – this is important to note! Do not stop offering choice to your students!
2. The number of options is important. Too few options lead students to assume that they are being controlled with 'false choice'; too many are overwhelming. In the research, this draining effect of too many options (and too many choices) is referred to as 'ego depletion' (Patall et al., 2008)
3. The number of times that students are invited to choose is also important. Multiple opportunities appear to yield greater benefits than making a single choice. However, after a certain point, being asked to make choices again and again becomes overwhelming and exhausting.
4. When choice is presented in a manner that implies pressure (from teachers or peers) to pick a particular option, then benefits are reduced.
5. Perhaps most importantly, the main benefit of choice is to boost intrinsic motivation so anything that reduces this 'inner drive' will reduce the positive impact of choice. The biggest detractors for intrinsic motivation are extrinsic motivators. I cover the negative effect of praise and reward systems in depth in Section 5.7.

3.6.1 Making Challenge Interesting

Students typically learn less when they are given a choice of tasks. Not because choice is a bad thing, but because they tend to pick whichever option they perceive to be the most likely to lead to success. In other words, they pick the option with less challenge, rather than more. They go low when ordinarily, we would prefer them to go high.

Some of the reasons why students do this are shown in Figure 24.

This doesn't have to be the case though. There are many things we can do to turn this around and cause students to choose more challenge rather than less. These include the following.

A. NO EASY OPTIONS. In the short-term, make sure you offer no easy options. This won't work forever because students, particularly older ones, will soon notice they are being misled by false choice. However, giving students choices between 'spicy', 'hot' and 'too hot to handle' (or whatever works for you to ensure the options range from challenging to super challenging) will help set your students off in the right direction.

B. CHALLENGE IS INTERESTING. Most students think challenge equates to 'difficulty'. This is one of the reasons why they find it so unappealing. After all, who likes difficulty? Who wishes for more difficulty in their lives? Certainly not me! I like challenges (the right kind!), but I have no fondness for difficulties.

   If your students think of challenge as difficult then their mindset ought to be modified. To help towards this, I use the term, 'interesting'. So, rather than giving the impression of challenge equating to difficulty, I do what I can to give the impression that challenge makes life interesting. For example, if I see a student doing something with ease (and I believe it is in their best interests to challenge them some more*) then I say something along the lines of, 'that seems to be too easy for you so let's try to make it more interesting.' Or, when one of my students

complains of a task being too hard for them, I respond with, 'it is interesting, isn't it? What strategies have you tried so far to figure it out?'

*The caveat in brackets above is important because there will be times when it is better for your students to be in their comfort zone. If, for example, they have been struggling to understand a concept and have at last figured it out, then resting in their comfort zone and consolidating their new learning could be the best option. In such a case, I would say something more along the lines of, 'well done for figuring it out. That took determination and strategy. Now, take time to go over it a few times and make sure you're absolutely happy with your solution before we find something to make it even more interesting for you.'

C. DO NOT PRAISE EASY SUCCESS. It is counterproductive to praise a student for succeeding with a task that was easy for them. I explore this in more depth in Section 5.7 The evidence is clear though: praising students for doing something that was easy for them implies that you either didn't realise how easy it was or that you have low expectations of their abilities (Meyer, 1992). Furthermore, since praise is often used to reward that which we want, many students make the connection (usually subconsciously) that completing easy tasks is what their teacher wants. This inadvertently steers them towards a preference for easier tasks in the future.

"Praise for successful performance on an easy task can be interpreted by a student as evidence that the teacher has a low perception of his or her ability. As a consequence, it can actually lower rather than enhance self-confidence." (Stipek, 2010)

Omitting praise does *not* therefore mean criticising instead! Rather, we should be confirmatory but neutral in our stance. For example, 'it's looking like you're getting that done easily. Would you like something a bit more interesting?'

D. PRAISE ONGOING EFFORTS. Do not praise your students when they are completing easy tasks but *do* praise them when they are engaged in more challenging endeavours. When your students are struggling, that is when they need praise most – and when it is most beneficial. Use it to encourage determination, effort, strategy, focus, willingness to try alternatives, thoughtfulness, collaboration and so on. Make sure you praise what they are doing rather than who they are. This is the difference between process praise and person praise. This topic is covered in more depth in Section 5.7.1.

E. DO NOT RESCUE (YET). When we rescue our students, we deny them the satisfaction and longer-term memory effects of figuring it out for themselves. That is not to say we should *never* help them! Unfortunately, though, too many adults (parents in particular) will rush to help children the moment they begin to struggle. Colloquial terms I've heard for this phenomenon include *snowplough parents*, *helicopter parents* and *bubble wrap parents*. I particularly like the Scandinavian version: *curling parents*; and the Japanese idea of *bonsai parents*. Whatever we call this approach to parenting, the effects are worrying; children who are overprotected tend to be more anxious and display lower levels of resilience, independence and self-efficacy (Gerull & Rapee, 2002)

This phenomenon isn't limited to parenting; it happens in schools too. So, the question is how do we get the balance right between doing our job of teaching without overly guiding our students? Here are three ways to frame our responses.

1. Think of a child learning to ride a bicycle. Initially, they tend to wobble a lot. When they do that, we encourage them; we don't rescue them. We *don't* do it for them. We cheer them on. 'Keep going! You're doing great', we call after them. We probably mix in a few words of instruction: 'Lift your head. Look far ahead of you; that will help you to balance.'

   This is exactly what we *should* do. We should encourage without rescuing. Incidentally, the English word 'encourage' comes from fifteenth century French, meaning 'en' (to put in) and 'corage' (meaning heart). Therefore, to encourage is to give heart. What a lovely notion! Better, I would say, than 'praising' them, given the problems associated with praise (covered in Section 5.7).

   Back to bike riding though. If a child falls off their bike, then that's when we should rescue them. Firstly, we check that they're ok then we put them back on their bike and give them some additional support. This normally means running alongside them, holding the bike frame and then letting go again at the appropriate moment. It doesn't mean riding the bike with them on the back. They continue to be the one attempting to ride, but this time we give them such extra support. Or, to use the term fist coined by Jerome Bruner (Wood, Bruner & Ross, 1976), we offer them some 'scaffolding'.

   The scenario of teaching a child to ride a bike can be a useful guide for everyday teaching. If we think of wobbling on a bike as 'cognitive wobble' in the classroom, and falling off a bike as failing at, or giving up on, academic tasks, then taking a similar approach to supporting them can be helpful. This means encouraging your students when they are confused or struggling, but *not* rescuing them. Then reassuring, instructing and scaffolding if a student is making absolutely no progress at all.

2. I shared earlier (Section 3.2) that Robert Wilson and his colleagues (2019) at Princeton Neuroscience Institute have calculated an optimal learning level of 80-85%. Above this level of accuracy, tasks are too easy for students so although performance will increase, learning will decrease. Below this level, challenge for most students becomes too much. Taking this as a guide, then anything in the range 65 to 85% accuracy should attract encouragement only: no rescuing. If accuracy drops further, going below 65%, then some instruction might be needed. Below something like 40%, scaffolding is very likely going to be required one way or another.

3. The other rule of thumb I would recommend is asking yourself if the challenges your students are engaging with are desirable ones. I realise this is a subjective question, but if your answer is 'probably yes', then I'd be inclined to encourage more and instruct less; if, however, the opposite is true then scaffolding is likely to be needed sooner.

   It is worth noting again, though, that 'desirable' doesn't necessarily mean sought after or wished for by your students. As described in Section 3.4, desirable

> difficulties often slow progress down and cause students to feel as if they are learning less well compared to when they attend to 'normal' (easier) tasks. The term 'desirable difficulties', therefore, relates to the attractiveness of outcomes rather than to the desirability of experiences. Learning should be judged in much the same way as I recommend judging feedback (see Section 4.3.3): by its outcome rather than by its inputs.

3.7 Challenge And The Learning Pit

When students overcome challenges, it has a positive effect on learning results. Extensive evidence shows this; a summary of which has been described in this chapter.

Unfortunately, though, research also shows that in normal circumstances, students tend *not* to choose challenge. If there is a more straightforward option offering immediate rewards – be that praise, satisfaction of task completion or the conservation of effort – then most opt for easy. This leads to the illusion of enhanced performance but ultimately, fewer long-term advantages.

Quite clearly then, the onus rests on us to persuade our students to step out of their comfort zones. Except that that is not very sustainable if we must always be the ones to drag them, point them or persuade them.

A different solution is therefore needed.

At the beginning of this chapter, I described four factors influencing students' decisions whether or not to step out of their comfort zones. These were a) thinking of challenge as being worth the effort; b) having a sense of personal control or efficacy during the challenge; c) feeling as if they have tacit permission to make mistakes or even fail; and d) being in the habit of taking on challenges.

Amongst the huge volume of research on motivation, one meta-analysis stands out. Conducted by Zepeda, Martin, and Butler (2020) and based on comprehensive investigations into what motivates students, they identified two criteria that stand out above all the others. These match the Goldilocks principle (Kidd et al, 2012) described in Section 3.5.

1. Students should perceive that achievement is possible; that they think they will be able to solve the puzzle eventually.
2. Students need to feel a sense of progress towards their goal; they need to feel as if they are getting better or at least, taking steps in the right direction.

In both cases, the Learning Pit can make a worthwhile contribution towards these.

The next four sections cover what this model is, why I created it, how to introduce it to your students, and ways to make it work with all the themes of this book – challenge, feedback, dialogue, growth mindset and questioning.

3.7.1 Learning Is Not Linear

> Too often, learning is described as if it were linear. Start with step one then take steps two, three, four and five. Pause to reflect and connect. Make sure you are happy with your first

five steps then take steps six, seven and eight. Keep going, even if your steps are small or slow: eventually, you will make it.

Sounds ideal except that so very often, steps one and two are *not* followed by three and four. Instead, regression rears its head. What we thought was straightforward enough last week turns out to have lots of exceptions this week. What we could do yesterday isn't working quite as well today.

This is normal. Learning tends *not* to look like a set of stairs heading towards excellence. Instead, performance dips will occur along the way.

I think students need to know this. Not so that they are fearful, but so that they can prepare better. If they anticipate setbacks, they can recognise them more easily when they occur, acknowledge that they are normal rather than something that only happens to them, and use productive strategies and attitudes to overcome the dips.

I call this going through the Learning Pit.

3.10 TEACH Brilliantly Top Ten: CHALLENGE

Challenge takes us out of our comfort zone. Vygotsky (1978) called this stepping into the *Zone of Proximal Development*. I call it going through the Learning Pit.

1. **Challenge is a vital and necessary condition in the learning process.** Without it, there will be no growth, only practice.

2. However, challenge also causes performance and progress to slow down. Its benefits lie in **boosting long-term memory and the ability to retrieve learning** when needed.

3. **The Goldilocks' Principle applies** to challenge: it has to be just right. Too much challenge results in anxiety or disengagement; too little leads to boredom and lower expectations. Wilson et al (2019) calculate the optimum is **15-20% of any task should be beyond current abilities.**

4. Contrary to popular opinion, the brain is *not* designed for thinking (Willingham, 2021). Whenever possible, brains will rely on memory and rehearsed responses. **Challenge provokes an alternative response.**

5. Challenge **increases the need for higher order thinking skills (HOTS)** such as analysis, problem solving, creativity, evaluation and metacognition.

6. **Challenge doesn't have to mean additional complexity or difficulty.** It can mean varying the conditions of learning with a different pedagogy, an alternative space, interleaving topics or creating an opportunity for students to generate their own solutions.

7. Expectations, encouragement, psychological safety and a sense of purpose contribute, but the **most significant factor influencing someone's willingness to engage in challenge is their resolve.** They are the ones who will decide whether to try it or not.

8. **Having a clear idea about the likely ups and downs of learning helps students prepare** and respond more effectively. The Learning Pit is very useful in this regard.

9. **The Learning Pit supports a culture of challenge**, showing students how to move from simple explanations through to the construction of robust, nuanced solutions.

10. As well as being able to attend to the challenge itself, successful learners are able to determine which strategies to use, when and why. This **metacognition is an important feature of navigating through the Learning Pit.**