



## CHAPTER 8:

### **WAS YODA AN EFFECTIVE SUPPLY TEACHER (AND WOULD HE HAVE BEEN BETTER IF HE'D USED BARAK ROSENSHINE'S TEN PRINCIPLES OF INSTRUCTION)?**

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*As Mikezilla and Beckzilla emerge from the city, Markzilla finally catches up with them. Mikezilla turns to him and says, gleefully: 'I've learned so much about Behaviourism! Look, here's a guide book I bought in the gift shop when I left. It explains so many of the city's cognitive structures. It's by Barak Rosenshine, it's really neat.'*

*Markzilla flicks through the book, scanning the bullet points. 'Yeah, there's some good stuff in here. But ... hmm, some doubts I have. Tell you about them, I shall.'*

This chapter is another one that uses the example of *Star Wars*, mainly because we liked the idea of Yoda as supply teacher, as he is forced to come out of retirement against his will to step up to teach Luke Skywalker when Luke's previous teacher is no longer able to do the job. We're also looking at a set of principles that has become widespread as key basic guidelines for teachers who want to teach effectively and efficiently. We discuss why we're not exactly on board with the idea that the principles cover all the basics, but they're a good place to start. We're interested in finding out: **Was Yoda an effective supply teacher (and would he have been better if he'd used Barak Rosenshine's ten principles of instruction)?**

It's a slight change to our usual format, in that we don't have a section on the pop-cultural thing we're using as an example, but just jump straight into applying the ten principles to Yoda's teaching style. We talked about *Star Wars* at length in Chapter 4, and it's a safe bet everyone knows who Yoda is, anyway. We've provided a brief recap of the key points, though, in case you skipped Chapter 4 and/or have been living on Tattooine for the last 46 years.

## The ten principles

Barak Rosenshine was an emeritus professor of educational psychology in the College of Education at the University of Illinois at Urbana-Champaign when he published his ten principles in *American Educator* back in 2012. Since then, he's extended the list to 17 principles.

A key part of Rosenshine's approach is declared in his subtitle for the article, *Research-Based Strategies That All Teachers Should Know*. Rosenshine calls these 'classroom practices of master teachers', which he unpacks with the care heavily associated with

the positivist end of the scale as far as evidence goes, although the article itself doesn't cite any research data.

1. Begin a lesson with a short review of previous learning.
2. Present new material in small steps with students practising after each step.
3. Ask a large number of questions and check the responses of all students.
4. Provide models and worked examples to help students learn to solve problems, using frameworks to hang ideas on.
5. Guide student practice.
6. Check students' understanding
7. Obtain a high success rate.
8. Provide scaffolds for difficult tasks.
9. Require and monitor independent practice.
10. Engage students in weekly and monthly review.

The links to cognitive science are apparent in that some of these principles draw on behaviourist ideas about giving immediate feedback, while others are concerned with how memory is laid down in the brain – review at certain points can help reinforce learning. Memory is key for learning. The more information we have available for immediate recall, the lower the cognitive load (covered in the next chapter) when we are learning new information and the more links that are available on which to build further connections.

Memory is built effectively through reiteration, so including these approaches is vital. Most people will have found it's the material that's reiterated, and employed, that stays in the mind. With Mikezilla it's *Warhammer 40000* stats, with Markzilla it's (classic) *Doctor Who*. Things that haven't been thought about for a decade or more spring instantly to mind because, for a period, they were recalled on a regular basis. If we want students to recall

massive amounts of useless trivia, this is exactly the approach we should take in the classroom.

That's the strength of these approaches. However, Rosenshine's principles surface the problem with an approach based on how the brain most efficiently acquires information. If it's used exhaustively, or exclusively, it can have a detrimental effect on learning. Unless the principles are applied imaginatively, they're demotivating because they're really, *really*, boring.

When we looked at the various approaches to learning in the previous section, we pointed to the issues associated with taking only one approach to learning and teaching (we'll look at the issues with purely constructivist approaches in the final chapter in this section). There's nothing in the ten principles about going off and doing things, making things, creating things, or talking to other students. These aren't a core part of Rosenshine's strategies, because they aren't evidenced in a positivist way by our knowledge of how memory is laid down in the brain.

A core part of learning is acquiring skills, which usually requires enacting them. The main skill you develop by reading a book is how to read – learning isn't a simple process of transferring information from one mind to another. But it is in part that process. Acquiring knowledge from others creates a strong basis on which to build skills, but it is only a basis. Memorising reams of information and formulae in the way that a lot of education requires of learners is like flint-knapping, a skill that's time consuming and no longer necessary, since every piece of information we could ever need is literally at our fingertips if we have a phone and an unrestricted Internet connection to hand. Learners need to acquire essential knowledge that they can draw on as they build their skills, but additional knowledge is almost certainly stored within easy reach – what learners need are the skills to access that information, assess it and, where appropriate, employ it.

With those caveats in mind, we'll explore the principles in more depth.

### **Principle 1: begin a lesson with a short review of previous learning.**

Daily review can strengthen previous learning and improve recall, and it's essential if the day's learning builds on the previous day's knowledge. If a student hasn't got the foundational material straight in their mind, the step that builds on that material isn't going to be understood. In addition, if learners must make an effort to recall what they have learned in the past at the same time as they are taking new knowledge on board, then this creates extra work and adds to their cognitive load. Where this departs from a constructivist approach to building on previous knowledge is that Rosenshine refers to knowledge as a set of principles to be understood, rather than as a set of principles that will be learned and understood in different ways by different students.

An issue with this is that, particularly when teaching at secondary level, if you see students only once a week, then the chances are they will have forgotten a lot of what was talked about in the previous session, because when you're 12 a week is a very long time. Applying this principle can mean spending a lot of time revisiting what's gone before without making any progress. The importance of this as a tip is the implication it contains – getting through the material is not as important as laying the right foundations. Without reiteration, establishing and re-establishing the information the students need to know, they will not learn new things effectively. You may get through the syllabus, but the amount learned by the students will be much less than it could be.

### **Principle 2: present new material in small steps with students practising after each step.**

Don't overwhelm students, introduce new ideas a few at a time, asking more questions and adding activities as part of that process. The idea is that you only can learn so much, and what you learn depends on your starting point. Video games are very good at this, introducing new skills incrementally, and giving players opportunities to practise those skills before moving on. It's the same in class. Rather than presenting a large amount of information at once in a video or lecture, or as a large amount of text, it's more effective to provide a small amount, discuss or think about it, produce some output that requires it to be processed in some way, then continue.

### **Principle 3: ask a large number of questions and check the responses of all students.**

Questioning helps students make use of new information and connect materials prior to learning more. It also determines how well the material has been learnt before moving on. However, it's difficult, particularly with larger classes, to ensure everyone has a chance to respond to questions. One option is to use response software (originally through clickers and now through mobile phones) to check the understanding of an entire class by using multiple-choice questions and seeing how many get the answers right.

A low-tech way of doing this is to ask students to write the answers on paper or small whiteboards and hold the answers up for the teacher to scan quickly. Alternatively, by asking students to come up with a response in small groups, you can create opportunities for students to teach each other if one student has an answer and others don't or some have the wrong answer and others the right one. Lack of consensus within a group helps to

identify misunderstandings that can be raised with the class as a whole.

One reason for checking everybody's learning and understanding while going through a lesson is that you can repeat part of the learning if necessary. This is a fantastic principle but incredibly hard to implement if the class includes learners with a wide range of abilities.

Rosenshine suggests using group activities to address this challenge, since these enable the students who have understood the most to consolidate their knowledge by supporting students who require further explanation. Another option is for each student to write down what they think the answer may be and pass their response along in a circular group activity. This becomes a community learning process in which students talk to each other about their responses, giving them a safe space in which to self-assess without calling out to an entire class, which can be hugely intimidating.

The most limited of the suggestions by Rosenshine is probably choral responses, when students shout the answers to the question together as a group. It sounds Dickensian but there's some evidence it works for learning in particular situations, such as language learning in schools (Heward et al, 1989). However, it would probably meet with resistance if physics undergraduates were asked to learn the names of bosons and leptons in this way.

An issue with all these techniques is that employing them too frequently or too slowly, for example by testing the knowledge of each student separately, will frustrate students who are ready to move on. They're likely to be banging their heads against the desk in frustration because they are so bored by the time you've finished checking the learning of the entire class.

**Principle 4: provide models and worked examples to help students learn to solve problems, using frameworks to hang ideas on.**

One of the problems with learning any new area is that starting with the details doesn't work. Learners need a map of what the whole subject area looks like, so they know where specific areas fit.

An issue with some distance-learning practices is that learners can be let loose on a subject, reading around various elements, without an overview of the domain and how it's structured. Without a deeper knowledge of the subject discipline, it's often difficult to make sense of the material. It makes sense to present material in a linear way (Verheij et al, 1996) to facilitate this initial surface processing. Once that is done, and deeper processing is possible, then you can let learners loose on the whole domain. Without a decent taxonomy of the overall set of ideas, it's more difficult for learners to work out where they are at any point. They need a map, or they get lost, so the fourth principle is very helpful.

**Principle 5: guide student practice.**

Successful teachers spend more time guiding students' practice of new material. Students need to internalise material by rephrasing, summarising and elaborating on it to rehearse and make connections. This links back to the second principle, presenting new materials in small steps. This all makes sense, but Rosenshine limits his examples to guided practice plus repetition of guided practice, without learners doing the same practice independently. The principle doesn't address teaching students to develop their own practice through open exploration and reflection, skills that are essential once students have finished their courses.

**Principle 6: check students' understanding.**

The longer a misunderstanding persists, the bigger an issue this presents for learning. With younger children, a lot of what a

teacher does involves addressing erroneous ideas the children have acquired. People build up, particularly around science, mental models that aren't accurate, but are based on perceptions of the world around them. Sadly, a lot of these erroneous ideas persist to the point where teachers retain and perpetuate them, if they're not addressed during teacher education (Ferrero et al, 2020).

A good example of this is one Beckzilla uses: projectile motion. If you throw a ball into the air, why does it stop moving upwards and fall to Earth? Children, and many adults, typically believe it is because somehow the initial impetus is used up. This feels like common sense, because the harder you throw the ball, the further it travels before beginning its descent. The only visible force that acts on it is the action of the thrower. However, the real answer is that the ball is acted on by gravity and friction. The idea that the initial impetus is used up is a common misunderstanding that arises because children are employing an intuitive interpretation of their direct observation rather than a scientific framework (Hynd et al, 1997). Checking on misunderstandings and then addressing these directly is essential for progress; to pre-empt the next section of this chapter, students must unlearn what they have learned.

**Principle 7: obtain a high success rate (this is a cracker of a principle!)**

For learners, this relates to operant conditioning (see the chapter on behaviourism and *Pokémon Go*). If learners receive immediate feedback telling them they've responded correctly, they feel good, carry on trying, and maybe try harder because their behaviour is being rewarded. They'll be more engaged and more motivated because they're succeeding. The principle is the same in games. If you're winning a game, you want to play more. If you die ten times in a row, you're going to give up. The success rate Rosenshine cites in his principles is 80%. This was the best tip

Markzilla remembers from his teacher training in Cardiff. One of his lecturers gave the example from his own experience of teaching the lowest ability group at maths and getting them to a point where they were succeeding more than the group placed above them academically, simply by making the tests easy enough for them to score 80% (Fontana, 1995).

Of course, in a classroom with a wide range of abilities, many students will be getting low grades while some are scoring above 90%. In effect, you're aiming for the majority to succeed four times out of five, or 80% of the time.

From a practical point of view, this approach fails when learners are assessed by an external examination system. At that point the score achieved by lower ability learners drops and they become hugely disillusioned. It's a difficult set of competing pressures; the core principle of 80% motivates students to carry on learning, but it can lull them into a false sense of security, believing they're doing better than they really are.

The difference here is between criterion-referenced assessment, where learners work to meet specified goals, and norm-referenced assessment, which compares their progress to the norm for a much larger group (see Chapter 3 for more on this). The students may make fantastic progress from a criterion-referenced perspective, but if they are starting from a low baseline, they may be unable to attain the norm for their age group. Not only that, but if all the previously low-achieving students in the country do well, then the norm is raised. However much progress learners make, norm-referenced assessment will show that half are above average in demonstrating they've achieved the standards the institution has set in the form the institution wants them demonstrated, and half are below average.

As an aside we should draw your attention to the slight wordiness of the last sentence in that paragraph. Whatever assessment you choose, it's worth remembering it's not actually

demonstrating learning, it's demonstrating the learning the institution has selected as important, in the form it's chosen to assess it in, using the tools (and overcoming the barriers) the institution has put in place. The best you can say is that it's the most effective proxy for identifying the actual learning, but always bear in mind it's not the same thing.

### **Principle 8: provide scaffolds for difficult tasks.**

The teacher shares a temporary scaffold to help students achieve something challenging. For example, a teacher might show students how to read and make notes on an article by drawing a central box and writing the article title within it, skim-reading the article, writing each main idea in a box below the central box, adding two to four important details under each idea, then summarising.

After the teacher has taken students through the framework on several occasions, they should be able to do this themselves, so there is no more need for the teacher to scaffold the task.

### **Principle 9: require and monitor independent practice.**

Students need extensive successful practice for skills and knowledge to become automatic. During this phase, not only should a teacher scaffold the work, but they should also check constantly that the student is handling the work.

### **Finally, Principle 10: engage students in weekly and monthly review.**

Rehearsal is the key to getting things locked into memory so they are remembered and can be used at appropriate times. This is explored further in the chapter that follows (*Hitchhiker's Guide* and cognitive load).

The essential elements of this principle are that, by forming and repeating connections between memories and associations,

memories are recalled more effectively and are moved from working memory to long-term memory. Working memory only has limited capacity and does not store information for long, whereas long-term memory can hold a lot of information indefinitely. When information is shifted to long-term memory, this frees working memory to process new information and make more connections.

Although there are ten principles overall, the essential elements are *modelling*, *scaffolding*, *reviewing*, and *rehearsing*. All these elements contribute to an effective way of acquiring knowledge effectively.

Having broken down the ten principles, we'll frame them in the context of the ultimate supply teacher, Yoda, in order to answer the question: **Was Yoda an effective supply teacher (and would he have been better if Barak Rosenshine's ten principles of instruction he'd used, hmmm)?**

## *Star Wars* and Yoda

We covered the long and multi-faceted narrative of *Star Wars* in Chapters 4 and 5 (Jar Jar Binks and ontology). Here, we're focusing on the first two films to be released: *Star Wars* (1977), later retitled *Star Wars: Episode IV A New Hope*, and *Star Wars: Episode V The Empire Strikes Back* (1980). As the prequels and then interquels made the numbering system increasingly difficult to follow, both have since been re-retitled to remove the episode numbers.

*Star Wars: A New Hope* focuses on the story of Luke Skywalker, who is caught up in a quest to deliver plans for a Death Star to the good guys (the Rebel Alliance), while being chased by the bad guys (the Empire). He comes across an elderly Jedi knight called Obi-Wan Kenobi who teaches him the ways

of the mystical Force. He also learns his father was killed by the villainous Darth Vader. On the quest Obi-Wan is then killed by Darth Vader.

In *The Empire Strikes Back*, Luke continues his schooling under a new Jedi Master called Yoda (a metre-tall green individual of an unnamed species). And, plot twist, when he quits his schooling to face Darth Vader, he finds out that Darth Vader is his father. That's possibly the biggest spoiler in film history but, as we mentioned in the podcast episode, if you haven't watched the movies by now, you're probably never going to watch them.

It's also worth noting that, as it's Luke's father who kills his teacher, *A New Hope* contains possibly the worst-ever meeting of a parent-teacher association.

It's because Yoda has to take over from Obi-Wan after Obi-Wan is killed that we're referring to him as a supply teacher, though it's worth mentioning that as: 'There is no death, there is the Force,' Obi-Wan turns up occasionally as a ghost to dispense more words of wisdom. He also comes up with an explanation for why, when he told Luke that Darth Vader killed Luke's father, he somehow mixed up the words 'killed' and 'is'.

## The answer

The following tables (see overleaf) examines how many of Rosenshine's principles Yoda applies as a supply teacher (rather than just getting out the telly on wheels and the VHS player, then putting on a film for everybody to watch<sup>1</sup>).



1. Non-Boomers should fill in their own supply-teacher example at this point. Perhaps dusting off a tablet that hasn't seen a software update since before COVID, or a treasure hunt for an HDMI cable.

Rosenshine's principles	Yoda's teaching strategies
Does Yoda begin each lesson with a short review of previous learning?	No, he basically leaves Luke to find his own way with a bit of extra guidance here and there.
Does Yoda present new material in small steps with student practice afterwards?	No, in fact he gives quite a long monologue at one point. <sup>1</sup>
Does Yoda ask a large number of questions and check responses of all students?	No, in fact he doesn't check understanding at any point, even though he only has one student.
Does Yoda provide models?	Both the Jedi – including Yoda – and their opponents, the Sith, use a cognitive apprenticeship model for learning. The master models particular behaviour, which the student then has to adopt.

Table 8.1 Yoda's applied principles

1. 'Size matters not. Look at me. Judge me by my size, do you? Hmm? Hmm. And well you should not. For my ally is the Force, and a powerful ally it is. Life creates it, makes it grow. Its energy surrounds us and binds us. Luminous beings are we, not this crude matter. You must feel the Force around you; here, between you, me, the tree, the rock, everywhere, yes. Even between the land and the ship.'

Rosenshine's principles	Yoda's teaching strategies
Does Yoda guide student practice?	Not really. There's a scene where Luke gets a feeling that there's something inside a tree. He goes inside it and then finds he's fighting Darth Vader, but when he strikes off Darth Vader's helmet, he sees his own face. He learns from this, but there's no guidance from Yoda, who is sitting outside, drawing things with a stick. In the NPR radio version, Luke thinks about the significance and concludes, 'My enemy's face is my own', but Yoda doesn't lead him to that conclusion. Or even ask what on Earth (or, rather, Dagobah) that even means.
Does Yoda check student understanding?	He asks some questions. But he doesn't allow Luke to ask questions, so he doesn't allow Luke the opportunity to identify the guidance he needs.
Does Yoda obtain a high success rate?	Well, yes, in that Luke does become a Jedi by the end of the first act of <i>Return of the Jedi</i> . That's a 100% success rate.

Table 8.1 Yoda's applied principles (continued)



Rosenshine's principles	Yoda's teaching strategies
Does Yoda provide scaffolds for difficult tasks?	No. The training he provides is experiential learning but without any scaffolding. Unless you count the advice, 'Try not. Do or do not. There is no try.'
Does Yoda monitor independent practice?	Luke is required to be an independent learner, but without any real framework that helps him to find his own way.
Does Yoda engage students in weekly and monthly review?	No, in fact his one student drops out before completing his training.

Table 8.1 Yoda's applied principles (continued)

From the table we can see that Yoda would fail any teaching assessment, he's not prime material for a teacher training course and, if he lived in the UK, he certainly wouldn't be in line for Fellowship of the Higher Education Academy.

In his defence, the entire structure of the training regime had been destroyed (and the student base murdered) 22 years previously, as shown in the prequel *Return of the Sith*.

Also, much of the curriculum is based on the concept of the Force, which is a vague ephemeral thing that is never properly defined: your own model of what it is might not necessarily be somebody else's because it's dependent upon a personal connection. Overall, Yoda definitely does not apply the ten principles.

Possibly the worst example of scaffolding teaching is when Luke is trying to lift his X-Wing out of the swamp with his mind. When he gives up, instead of breaking down the task into a sequence of more straightforward elements, Yoda simply lifts the X-Wing himself, mainly, it seems, to put Luke in his place.

When Luke reacts, 'I don't believe it,' Yoda puts the pedagogical boot in further by responding, 'That is why you fail.' A great scene, but a very demotivating teaching approach. From a behaviourist perspective, Yoda is much more in favour of acting to discourage failure than of acting to encourage success.

On the other hand, the teacher who Yoda replaced, Obi-Wan Kenobi, does a much better job of teaching before he dies. He continues to outshine Yoda as a teacher even after his death, which must rankle. Obi-Wan adopts an effective apprenticeship model in which he presents activities and then encourages Luke to copy them.

For example, when Luke is struggling to let go of his conscious thoughts, Obi-Wan suggests he should wear a helmet with the blast visor down and attempt the action again in a controlled safe environment, as opposed to chucking him into the middle of a swamp full of monsters and asking him to pull an X-Wing out of it. Obi-Wan applies some of Rosenshine's principles and includes experiential elements, encouraging his student to undertake practice and then guiding that practice.

The approach Yoda should really have taken was to suggest to Luke that he should try moving a small rock, then a larger one, then a boulder, moving him up to X-Wing-sized rocks before setting him off on the actual X-Wing.

After that, he could have presented the mental model, which is that size matters not, the difference is in the mind, therefore all your concepts about mass and weight are your own impositions. Ultimately, by the beginning of the Dark Empire trilogy, Luke is moving Star Destroyers with his mind, so he does learn eventually.

But the initial approach, ‘Try this massive leap in ability, then gloat when your student can’t do it,’ is bound to destroy a learner’s confidence. Something we’ll return to in Chapter 13 (BeanDad and constructivism).

In short, to answer our question – no, Yoda was not an effective supply teacher and, at some point, someone at the Jedi Academy should have pointed him in the direction of the ten principles – or whatever the equivalent would have been a long time ago in a galaxy far, far away.

## Tips for practice

In summary, for guidance, Rosenshine’s tips are an entirely practical set of principles. As far as they go, they work well at creating effective and efficient learning opportunities. But there’s a lot more to learning than acquiring knowledge efficiently and effectively.

It’s also worth pointing out that one of the reasons why Obi-Wan Kenobi is such a good teacher is that he colossally failed at teaching 20 years earlier (one of his padawans was Anakin Skywalker, who went completely off the deep end). Reflecting on our mistakes, and becoming better because of them, is also something we can draw on when planning our own teaching.

## Don’t barrack, just rise and shine (and reference)

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