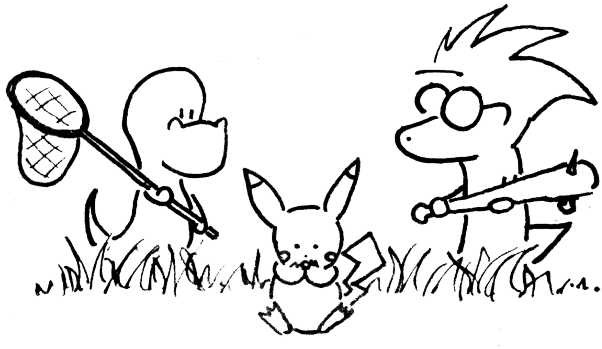


CHAPTER 7:

HOW DOES BEHAVIOURISM HELP PLAYERS CATCH 'EM ALL IN POKÉMON GO?

Rebecca Ferguson and Mike Collins

With the map thoroughly digested, the travellers, now numbering three, are now fully prepared to explore the Realm of Pedagogy. At least, there should be three. Markzilla is nowhere to be seen. Losing one of the group is not a very good start to the journey. 'I'm sure he'll catch up with us,' says Mikezilla, though knowing Markzilla, he's not very sure at all.

'Let's start with a visit to the capital of the first land in the Realm of Pedagogy,' says Beckzilla. 'It's the Land of the Dwarves and their capital city is called Behaviourism. It's the historic gateway to the lands beyond. Also, see this cool game on my phone – we can play it as we explore.'

Behaviourism gets a lot of bad press, and not just because it's spelt different ways in different countries. 'Behaviorism is called a cult, absurd, nonsense, grim, unethical, and poison' (Abramson, 2013). Google, when prompted, suggests questions such as: 'What is the problem with behaviourism?'; 'What are the main criticisms of behaviourism?'; and, more bluntly, 'Why is behaviourist approach bad?'

Is it really a theory from the bad old days of rote learning and corporal punishment that should now be cast into the Quagmire of Neuromyths, along with learning styles? Or is it actually a way of learning that, under the alias of gamification, is used extensively and successfully in everyday life? In this chapter, the Zillas investigate by asking their own question: **How does behaviourism help players catch 'em all in *Pokémon Go*?**

Pokémon Go

Pokémon was originally a Gameboy game released in 1996, a fantastic little adventure where you play a ten-year-old who meets a crazy old professor who sends you on a quest across all the islands in the Kanto region. While there you, as a ten-year-old, battle and collect a series of creatures with the aims of suppressing Team Rocket and becoming champion of the *Pokémon* League. It's a multimedia franchise that grew into trading cards (more than 42 billion of these have been sold), cartoons, many video games, films, television, film soundtracks, clothing, soft toys, bedsheets, bath towels, and toys. Pikachu is probably the Pokémon most readily associated with the game. A cute, friendly little electric hamster with red cheeks, it sits on the shoulder of its trainer. Any saleable item you could conceivably stick Pikachu on has had Pikachu added to it at some point.

Pokémon battle each other under players' guidance. If they lose a battle, they faint and then revive, smiling. There is no death in *Pokémon*, even though there are challenges, villains and battles. It's a game that encourages people to make connections with each other, trade with each other, befriend each other, and (with *Pokémon Go*) get outside and move around. Like many other games you play on your phone, you can play for free (after your original investment in the phone, in data, and perhaps in an external battery pack to support extended playing sessions) but there are also opportunities for micro payments within the game, which is what makes it vastly profitable. *Pokémon Go* made $1.21 billion in 2021, the second year in a row it had made over $1 billion, and it is just one part of the hugely successful brand.

Overall, *Pokémon* is one of the biggest video game franchises of all time. It's beaten by *Mario* and *Tetris* but, apart from that, it's everywhere and has been everywhere for more than a quarter of a century. *Pokémon Go*, produced by American software company Niantic, is the augmented reality version of *Pokémon*. Its appearance in 2016 widened access from game consoles such as the Gameboy and the Switch. You can play *Pokémon Go* on your phone, which means you can play it out in the wild. It was the real breakthrough point for augmented reality. Until the game's launch, augmented reality was a relatively niche interest that enabled people to overlay things on to day-to-day reality. Once the game launched, everybody was overlaying little Pokémon onto their day-to-day reality, staring through their phones at what was going on in the game world.

So, just what was going on in that game world? Interactions with an ever-expanding range of creatures (Pokémon), trainers (players), locations (pokéstops and gyms found worldwide) and tasks. As the developer, Niantic, says: 'You create your own story in this RPG [role-playing game]!' That's rather vague, but

Niantic has tried to explain the game on Apple's app store, which is one of the places it can be downloaded.

> 'Pokémon Go *is an immersive open-world experience that enables you to live the Pokémon adventure in augmented reality. Find and evolve all Pokémon to complete your Pokédex, and battle other players in PVP [player versus player] in this multiplayer RPG.'*

It adds that you can 'join one of the three teams and customise your avatar. Choose your Buddy Pokémon from your Pokédex to travel at your side'.

On The Open University campus, where some of the Zillas work, you'd see large groups of people going for walks past the beautiful landscaping and artwork with their heads buried in their phones, occasionally stopping in weird clusters. You'd later find that was because a particular Pokémon was spawning, or there was a gym there where Pokémon could battle. People who were not usually seen in the open air would be spotted walking in clusters with their phones. There were three gyms around the library, which meant large numbers of people would head there at the same time and then stand around outside the doors rather than going in to use the resources. People were nipping out for a coffee and catching a Pokémon or two on the way. This activity died down during Covid lockdown but has gradually returned.

When *Pokémon Go* first came out, it was a major event and people signed up worldwide. The game was downloaded 260 million times in its first year. Collectively, players walked 8.7 million km while playing, getting much needed exercise (Schilling, 2016) and triggering security alerts (Whistlecroft, 2016). The initial flurry of activity was inevitably followed by news articles saying nobody was interested anymore, interest had died down, and lots of players had left. However, eight years

later it's still huge. There are Pokémon gyms all over the place, in almost every country in the world. Many of these change hands several times a day.

This means the *Pokémon Go* franchise has to keep moving forward in order to cater for all these people engaging multiple times a day. Some people are playing the game whenever they're moving around. Some are playing it at their desks at work. To keep them engaged, there have always got to be new things. Originally, there were 151 Pokémon, but at this point there are over 800, plus a range of variant forms. You might have a shiny Pikachu, a lucky Pikachu, a poisoned Pikachu, a purified Pikachu, and a set of Pikachus wearing a range of cute little hats. You can just keep collecting.

There are two main aims for Pokémon players. You can aim to win the league because you are best at battling the Pokémon or you can aim to catch 'em all, which is the game's slogan, and part of the question the Zillas are answering here. As the leagues keep shifting, and the variant Pokémon forms keep increasing, both goals remain tantalisingly out of reach for players, but sub-goals and challenges keep them engaged.

Pokémon has prompted a lot of serious research, including research into education. There's a professor of education in America – Joseph Tobin – who does a lot of ethnographic studies, investigating subjects such as how communities work. He found that what keeps people engaging with *Pokémon* – certainly something that keeps children engaging with *Pokémon* – is that there are very long lists of the different creatures, and the more you know about these the more successful you can be. They exist in an increasingly rich fictional universe and each type has different characteristics and personality. Jigglypuff, for instance, sings a little song, which sends its opponents to sleep, leaving it free to draw pictures on their faces. Cubone, on the other hand, is adorable – except it dresses in the skull of its dead

mother. Children can learn these things and show off to their peer group about their knowledge.

Researchers at Stanford (Gomez et al, 2019) have carried out MRI scans of the brains of people who are very good at playing *Pokémon* and of others who haven't played the game at all. These scans showed that certain parts of the brain fired up when the experts recognised Pokémon. This was not the part of the brain that fires up when they recognised a word or a place, it was a specific 'Pokémon recognition area'. Looking inside players' heads revealed that the game had literally changed their brains. Which takes us on to behaviourism.

Behaviourism

More than a hundred years ago, at the start of the 20th century, anyone who wanted to investigate learning didn't have the opportunity to look at what was going on in the brains of living learners. There were no MRI scans – those weren't developed until the 1970s – and so scientists had to rely on self accounts to find out what people were thinking. At the time, psychoanalysis was becoming increasingly influential. Its leading proponent, Sigmund Freud, argued that behaviour and cognition are largely determined and driven by the unconscious mind.

Behaviourists were sceptical about that view. In their opinion, we don't know what's going on in people's heads, so it's no good coming up with a theory about something we can't see; something we can't observe. They felt that the scientific approach should involve looking at things we can see; doing experiments with things that we can observe. They couldn't observe the brain at work, but they could observe behaviour, so that was what they chose to study. How do we know if somebody has learned

something? They change their behaviour. This was a logical scientific approach that made learning measurable.

It also provided a definition of learning. When we talk about learning, we usually don't particularly define the term, even though one of the things academics love is defining terms! If you asked a behaviourist, 'What is learning?' they would answer, 'It is a long-term change in behaviour based on experience.'

That's a useful definition. It excludes some sorts of learning, because not all forms of learning *are* long-term changes in behaviour. You could know something in your head without expressing it in your behaviour in any way. Nevertheless, it's a useful definition and it has the advantage that it can be investigated scientifically.

While Freud was publishing case studies in Vienna, the Russian scientist Ivan Pavlov was famously working with dogs, in research published in 1897. He trained a series of dogs to expect their dinner when he rang a bell. He rang the bell, then he gave them meat. He rang the bell, they began to salivate because they were expecting food and he gave them meat. Eventually, he could ring the bell and they would salivate even though they received no meat.

Breaking that down a bit further, if you give a dog meat, it will salivate. That's an unconditioned response, as that is what the dog would do naturally. Pavlov's influential experiment developed this unconditioned response into a conditioned response. By the end of the experiment, he could ring a bell and the dogs would salivate. They weren't consciously thinking, 'A bell is ringing, we must salivate' – partly because that's almost certainly not how dogs think – but mainly because the salivation response is not under conscious control. They salivated involuntarily.

These conditioned responses and the discovery that you could induce reactions in this way proved to be of great interest and were part of the work that gained Pavlov a Nobel prize in

1904. Developing a conditioned response in this way came to be known as 'classical conditioning' and it fed into behaviourism.

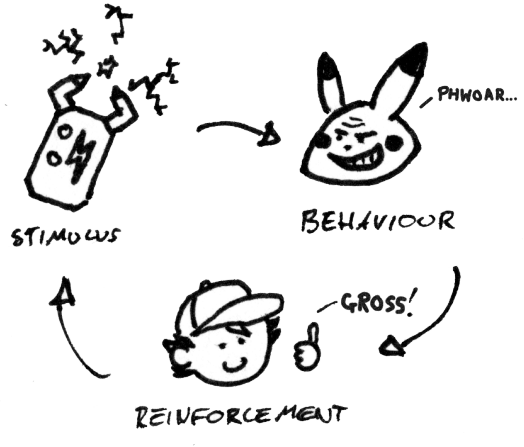
Classical conditioning was demonstrated in humans by John Watson and Rosalie Rayner in what came to be known as the Little Albert experiment, published in 1920. The two scientists set out to use conditioning to produce a phobia. They selected a nine-month-old child, 'Albert', and gave him a series of baseline tests, exposing him to stimuli including a rat, a monkey, a dog, and a rabbit. Albert showed no signs of fear when he encountered any of these. When Albert was 11 months old, the scientists gave him a laboratory rat to play with. He did this happily at first, but then the scientists began to make a loud and frightening noise behind him whenever he touched the rat. After some time, Albert was presented with the rat but no noise. Nevertheless, Albert became very distressed when he saw the rat. In fact, in further experiences, Albert appeared to generalise the experience to other furry objects, from dogs and rabbits to a Santa Claus with a furry beard.

Although the design of the research was weak (there was only one subject, so no evidence that this reaction would be common to other children or adults) and ethically dubious (no effort was made to reduce the phobia that had been induced) there were no serious challenges to the idea that classical conditioning applied to humans.

Behaviourism developed ideas around conditioning further, moving into operant conditioning. This is a way of modifying behaviour using the effect of its consequences. If someone engages in behaviour you want to encourage, you make sure it produces an effect that reinforces that behaviour. If they engage in behaviour you want to discourage, you make sure it produces an effect that inhibits that behaviour. The classic example of this is the carrot/stick approach. If a donkey moves in the right direction you give it a carrot. If it moves in the wrong direction

(and you're not too concerned about cruelty to animals), you hit it with a stick. After a while, it's conditioned to move in the direction you prefer.

In the USA Edward Thorndike, like Pavlov, was carrying out animal experiments, most famously with a series of puzzle boxes from which animals had to learn to escape. These experiments led him to propose a law of effect – that consequences are needed for learning. Behaviour followed by pleasant consequences is likely to occur again; behaviour that is followed by unpleasant consequences is less likely to be repeated.



To some extent, that response is baked into us, just like salivating when given meat is baked into dogs. We touch a fire, it burns us, we don't touch it again. We eat a cake, it tastes delicious, we eat some more. The law of effect suggests that these automatic reactions can be harnessed to help individuals to learn in other situations. Thorndike also proposed the law of exercise – learned behaviour fades without practice. Again, this is a principle that can be built into education to help people to retain knowledge.

The animal experiments carried out in the USA, Russia, and elsewhere made use of a relatively limited range of variables – food, pain, and freedom. Human learning offers a wider set of options, with actions leading to consequences that provide either a positive or a negative social response. On the other hand, reactions to these responses are not clear cut – what one person views as positive another may view as negative, and vice versa.

Overall, the behaviourists thought about learning in terms of observable behaviour rather than in terms of what was going on inside people's heads. They noted that external events and actions change the behaviour of individuals. In the classic nature/nurture debate, behaviourists come down heavily on the side of nurture. Yes, some elements of behaviour are innate, automatic reactions, but these reactions can be harnessed to change what individuals do. John Watson, one of the scientists involved in the Little Albert experiment, said in a lecture:

> *'Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select – doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors. I am going beyond my facts and I admit it, but so have the advocates of the contrary and they have been doing it for many thousands of years.'*
>
> (Watson, 1924)

The claim is impressive, but less so when compared with real-world experience – three of Watson's four children attempted suicide, and one of his grandchildren developed psychological issues that she attributed to being raised according to his theories.

The behaviourists were taking a systematic approach to understanding animals, they were taking a systematic approach to understanding humans, and they were trying to be objective about psychology. They were finding out that if we do X, then Y will happen. There are all sorts of good scientific reasons why you'd want to go down those routes. And the classic thing that you come to is operant conditioning. You either reinforce the behaviour that you want or you punish a behaviour that you don't want.

If you're training your dog and it's done something you want to encourage, you might give it a doggy treat. That would provide positive reinforcement. Or you might take off its lead, removing something it doesn't like. In both cases you're reinforcing the desired behaviour. On the other hand, your dog might do something you want to discourage. In that case, you might add something negative to its life by speaking to it sharply or even giving it a whack on the nose. Or you might take its food away, removing something pleasant from its life.

Constructivists might not see this as operant conditioning. They might argue that the dog is making connections between events and building schema that link the behaviour and the response. So the constructivists would infer something unobservable (the building of schema) is taking place, while behaviourists would focus on what they could actually observe and measure – changes in the dog's behaviour. And, because these classic experiments were carried out with cats, dogs, rats and pigeons, maybe it would be a mistake to assume that schemas were being constructed.

If you use positive and negative reinforcement to teach a pigeon to peck a lever, you're not assuming that the pigeon has some mind map behind its behaviour; you're simply aware that if you act in certain ways towards a pigeon then that pigeon will change its behaviour in a predictable fashion. Obviously,

humans are also animals, and in many ways we behave in the same way as other animals, but that doesn't mean we can assume a pigeon is thinking in the same way as a human.

Nevertheless, teaching children and animals in similar ways is where behaviourism can work very well. It's a good strategy for prompting children to memorise foundational knowledge; not the things they need to build and interpret themselves, but the essential pieces of information, such as times tables or number bonds, that can give them a head start. You'd be very unlikely to set a seven-year-old child a piece of problem-based learning that required them to work out how to count in fours from first principles, but most seven-year-olds will be encouraged to memorise that times table. That process will be supported by positive and negative reinforcement – they'll receive praise, good marks and approval when they succeed, whereas they'll get bad marks, removal of privileges, or even punishments if they don't succeed.

A lot of early-years education is based on call and response – the teacher says something and pupils receive positive or negative reinforcement that encourages them to respond in the way the teacher expects. The phrase 'two times two' elicits the response 'four'; the phrase 'eight plus two' elicits the answer 'ten'. This is often referred to as 'rote learning', which is a strategy for memorising information by repeating it multiple times. But operant conditioning isn't simply rote learning, because it always involves either positive or negative reinforcement.

Again, constructivists would say there is more to it than that. The aim is not simply to get children to be able to parrot a set of phrases – they have to understand what they are saying, in what contexts this knowledge can be used, and how to apply it. In reality, it's helpful to do both – to memorise basic facts so you can do simple calculations without reaching for a calculator,

but also to understand the meaning of those facts so you can use them outside the classroom.

Behaviourist techniques help people to acquire the building blocks that are used repeatedly in learning situations. Throughout our lives, our education builds on our previous education. The chapter you are reading requires both reader and writer to have learnt how to read and write the English language, to have grasped complex vocabulary, and to understand how books are structured. Since we were very young, if we live in an English-speaking country, we have been conditioned to do those things, and we have had the very powerful incentive of using language to make our thoughts and wishes understood. Throughout our lives, we have built up metacognitive toolkits that enable communication through the written word. For psychologists and linguists there's an issue about whether classical or operant conditioning is involved, but for our purposes we can note that, in most situations, understanding what is happening leads to positive reinforcement, and remaining confused leads to negative reinforcement.

When teaching pedagogy, or Western educational theory, a common approach is to summarise behaviourism, then cognitivism, and to go into more detail about constructivism and social constructivism. Behaviourism is often treated as something from the past, a theory of learning that has been superseded by other, better theories. It may be dismissed as the wrong way of approaching teaching. To some extent that is true, but any method of teaching can be the wrong method in certain circumstances.

Behaviourism has been very influential in many areas, including language learning. The drill, response, repeat pattern is used in many language classrooms around the world. This sort of approach is associated with the conjugation of verbs ('amo, amas, amat' or 'Je vais, tu vas, il va'); with standard responses

('Comment vous appelez-vous?' – 'Je m'appele Pedagodzilla'); and with listen-and-repeat sessions in language labs. There are several problems with this approach, the most obvious being that it doesn't prepare learners to use the language outside the classroom.

From a behaviourist point of view, a significant issue is the extent to which rote learning is confused with behaviourism and, particularly, with operant conditioning. As we said earlier, repetition alone is not enough for operant conditioning; positive or negative reinforcement is also required. For the conditioning to be effective, the reinforcement must be directly linked with the behaviour and not delayed until a test at the end of the week, an exam at the end of the year, or until the learner is in a situation where the language is needed. This confusion of repetition with operant conditioning is one of the things that has got behaviourism a bad name and, incidentally, goes some way towards explaining why so many people in the UK fail to learn a language even after years of being urged to 'écoutez et répétez – listen and repeat.'

However, despite decades of misapplication in the classroom, behaviourism was used by at least 54 million language learners a month in 2022. That's the number of monthly active users reported by *Duolingo* that year, and *Duolingo* makes heavy use of behaviourism, under the guise of gamification.

Gamification is the practice of taking something that isn't a game – in this case, language learning – and using strategies and mechanics from games in order to encourage engagement, motivation, and loyalty. The game elements that are used include point scoring, competition with others, timers, badges, and leaderboards. Done well, gamification can shift learners' emotional responses, making them happy to engage with learning, eager to progress, and able to progress successfully while in a flow state. On the other hand, gamification is often presented

in the style of chocolate-covered broccoli, an attempt to disguise something considered unpleasant by adding a superficial layer of something more enjoyable. In those cases, its use may emphasise to learners that even their teachers regard these learning tasks as boring drudgery. For more on gamification, and why it's different from game-based learning, take a look at a *Pedagodzilla* journal paper on the subject (York at al, 2022).

A gamified app, such as *Duolingo*, can apply operant condition flawlessly. Has the learner completed the task correctly? They immediately receive positive feedback, a green bar, a large tick, the word 'correct', and the chance to move forward. Are they making good progress? Then they move forward on the golden trail to the treasure chest. Have they engaged with the tasks for several days in a row? Don't break that streak! Motivational messages – 'You're crushing this', 'Keep it up, slugger' – encourage engagement, as does the opportunity to move up a league and to join the week's leaderboard. Their streak grows, and they acquire new titles: Superstar Learner or even Galactic Legend. They fail to engage for a day, an undesirable behaviour, and immediately lose both their streak and the title associated with it. The app plays the part of a constantly attentive instructor, ready at any time of the night or day with immediate feedback or consequences designed to encourage the learner to engage in the desired behaviour of producing a stream of correct answers every day. Behaviourism at its finest.

The answer

Once you've spotted behaviourism at work in *Duolingo*, you can see it being used across many apps. Not necessarily to encourage you to learn – the desired behaviour is typically to keep you spending time and/or money in order to make a tidy profit

for the app owners. However, most games encourage players to undertake some learning, even if it's simply how to use the controls and score points. More complex games require a lot of knowledge to play successfully.

In his book, *What Video Games Have To Teach Us about Learning and Literacy*, James Paul Gee details how the game *Tomb Raider* teaches users a complex backstory, and how to play, and how to be subversive within the game – all without breaking the bounds of the game world. Gee's work shows how complex the pedagogy of video games can be – he identifies 36 learning principles that are used. One that is particularly relevant in the case of both *Duolingo* and *Pokémon Go* is the amplification of input principle: 'For a little input, learners get a lot of output.'

Pokémon Go cleverly uses operant conditioning to keep you playing, providing a great deal of output in the form of feedback and rewards. The more you play, the more you learn about Pokémon and the imagined world they inhabit. If you're going to catch a Pokémon, you need to know things about that Pokémon, such as where you might find it, which berries you might feed it, and how you might catch it. Some Pokémon are usually only found in the wild in certain parts of the world. Mr Mime appears in Europe, Volbeat in Asia, and Pansear in Africa. If you don't live or travel in those areas, you'll need to know how to make friends, trade, cheat, or access special events. Some Pokémon evolve from others, so you need to know and meet the preconditions for evolution. The game prompts players to learn all this information, and it does this using operant conditioning.

There are four possibilities with operant conditioning. Desirable behaviour is reinforced, either by adding a reward or by removing a negative feature. Undesirable behaviour is discouraged, either by adding a negative feature or by removing a reward. If a player learns enough to be in the right place with the right equipment to catch a Pokémon, they'll receive experience,

points, virtual candy and stardust as rewards. If it's the first time they've caught that type of Pokémon, it will be added to their Pokédex (which records all the species and whether they have already been caught by that player), and that effectively removes the task of catching that type, thus removing a difficulty.

On the other hand, the player might display undesirable behaviour. They haven't learned enough about Pokémon, their strengths, weaknesses, attacks and defences. This has the negative consequence that when the player sends their Pokémon into battle they lose. Not only that, they have to give up things of value within the game, revives and potions, in order to restore that Pokémon's energy.

These positive and negative consequences are relatively minor, not enough to discourage a player or to stop them playing the game. Together, though, they support a plan of action that involves learning more and more about Pokémon in order to maximise positive reinforcement and minimise negative reinforcement. Learning is rewarded – if not immediately, then fairly quickly. Failure to learn leads to a string of negative consequences, but also repeated chances to learn and to develop skills.

Tips for practice

Immediate feedback is a crucial aspect of operant conditioning. The algorithms behind apps are on the lookout 24/7 for input and will respond at any time of the day or night. Human teachers can't provide feedback at the same rate but providing it as soon as possible remains important. Students are often asked to carry out complex activities but may not receive a response for days, weeks, or even months. Completing a task successfully doesn't immediately lead to reward, and completing a task

unsuccessfully doesn't immediately produce a negative reaction. Building in opportunities for fast, responsive feedback can help to build good learning behaviours.

Behaviourist approaches can be used to encourage a variety of good learning practices. If you don't want students to cram for an exam at the end of term, but to keep returning to material throughout the term, then provide immediate positive feedback when they do this. If you want children to sit down with a book when they come into the classroom, rather than milling around chatting, then set that initial expectation and provide positive reinforcement. You can do this openly – no need to conceal the pedagogy. Explain what you want to happen, explain what the rewards and sanctions will be, and apply them immediately and consistently. We'll see these principles in action in the next chapter when we look at whether Yoda an effective supply teacher was.

Looking beyond behaviourism, consider *Pokémon Go* more broadly. A quick scan of *Bulbapedia*, the online encyclopaedia and fan site for the game, gives an indication of how much there is to know about the game, its characters, its species, its items and its moves. Listed in a text book, this information would almost certainly feel dry and uninteresting. If players were set to learning all this information, and examined at regular interviews, with a test pass enabling them to level up, and a test fail leaving them to go over the same ground, how many would persevere? How many would fail and drop out? A big part of the game's success in keeping people interested is that new knowledge and skills can immediately be put to use, are directly relevant to what players are trying to achieve, and have clear value to the players. These elements are important in all disciplines and can be built into any subject area.

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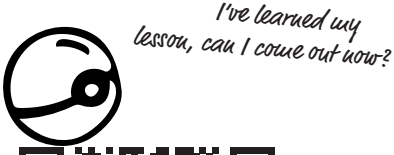

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PEDAGODZILLA

EXPLORING THE REALM OF PEDAGOGY

MARK CHILDS, REBECCA FERGUSON,
MIKE COLLINS & ELIZABETH ELLIS