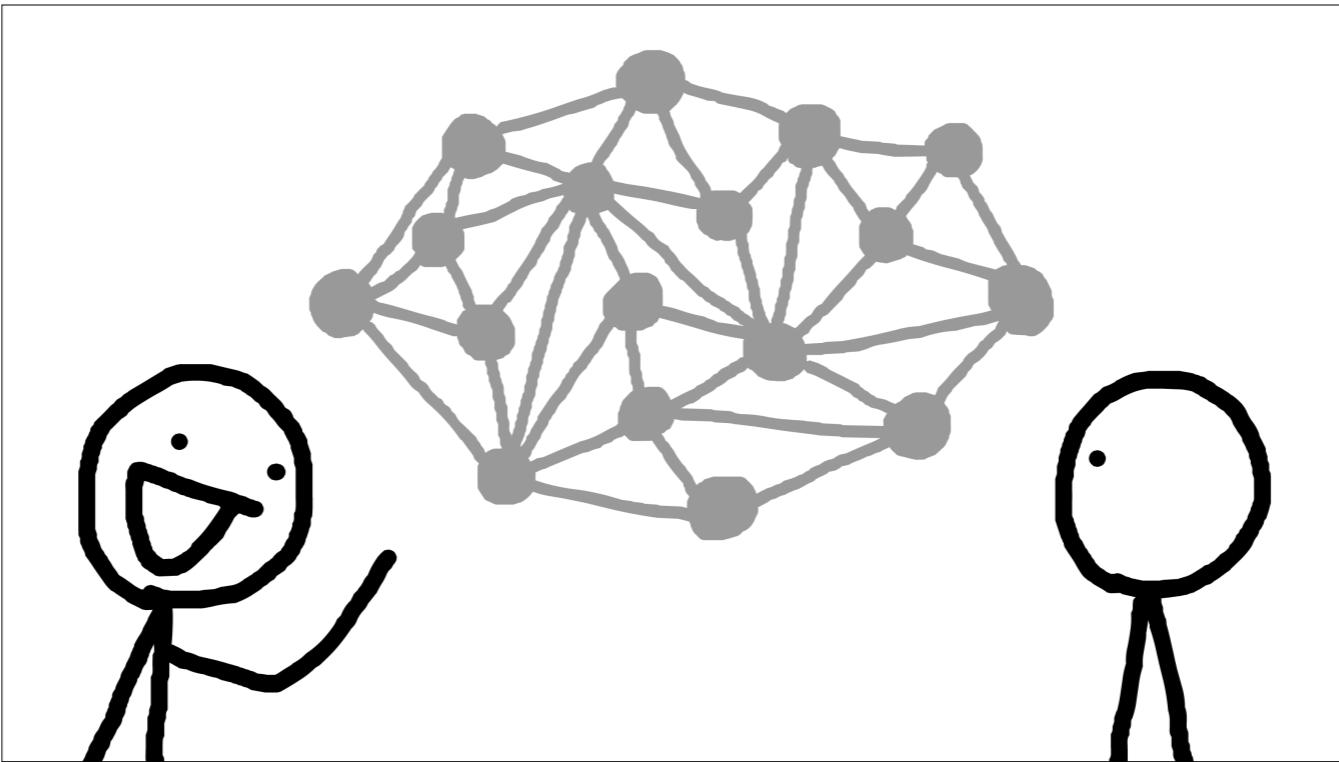
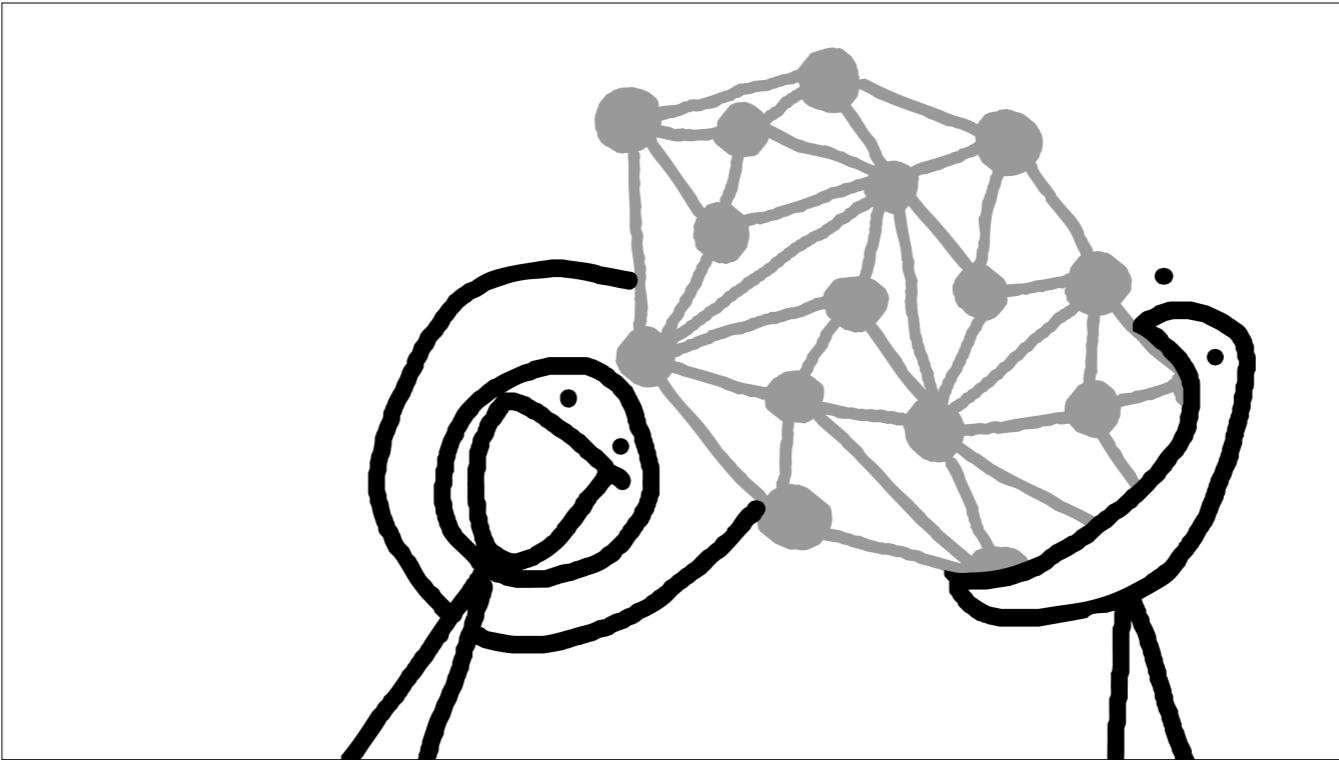


**Nicky
Case
@ncasenmare**



So you think your game is HOT STUFF. You've got a dozen mechanics, all inter-connected in unique ways to give rise to emergent gameplay... Now all there's left to do is actually teach it to the player, so...



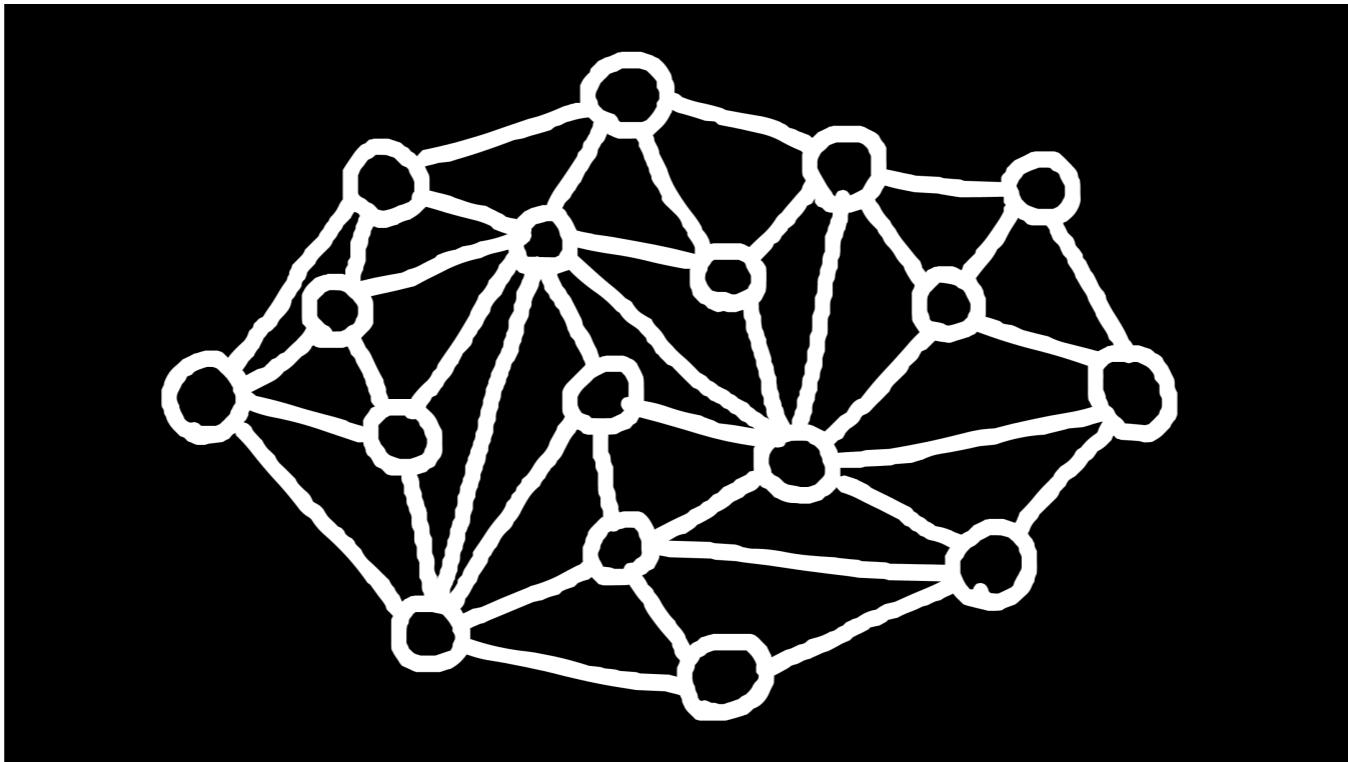
[beat]... Looks silly, but we do this sometimes. We frontload tutorials, we dump walls of text, we ask players to swallow a whole system in one go. So how DO you better help people understand complex ideas? For that, let's look to...

Cognitive Psychology!

Cognitive psychology! This is a sub-field of psychology full of lab experiments and fMRIs, trying to understand *how* we understand. How we think, remember, learn. There's just two big lessons you need to know:

1. LONG-TERM MEMORY is AWESOME

ONE: our long-term memory is AWESOME. It's why you never forget how to ride a bike, why you know over ten thousands words in your native language, why you know how to design or code or make art, music, stories.

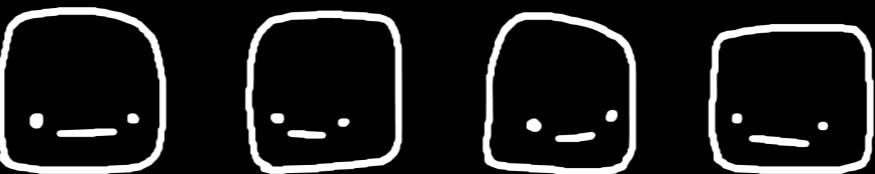


It's also why players can understand systems in games. When your player learns your game, what they're doing is building connections in their head – literally, with neurons. Great! However, the problem is our other big lesson from Cognitive Psychology:

2. SHORT-TERM MEMORY SUCKS ASS

TWO: our short-term memory sucks ass. You know when you want something, so you go to a different room... and then forget why you went to that room? Happens for the same reason frontloading tutorials in games doesn't work. Short-term memory's limit. So what IS that limit?

4 +/- 1 chunks

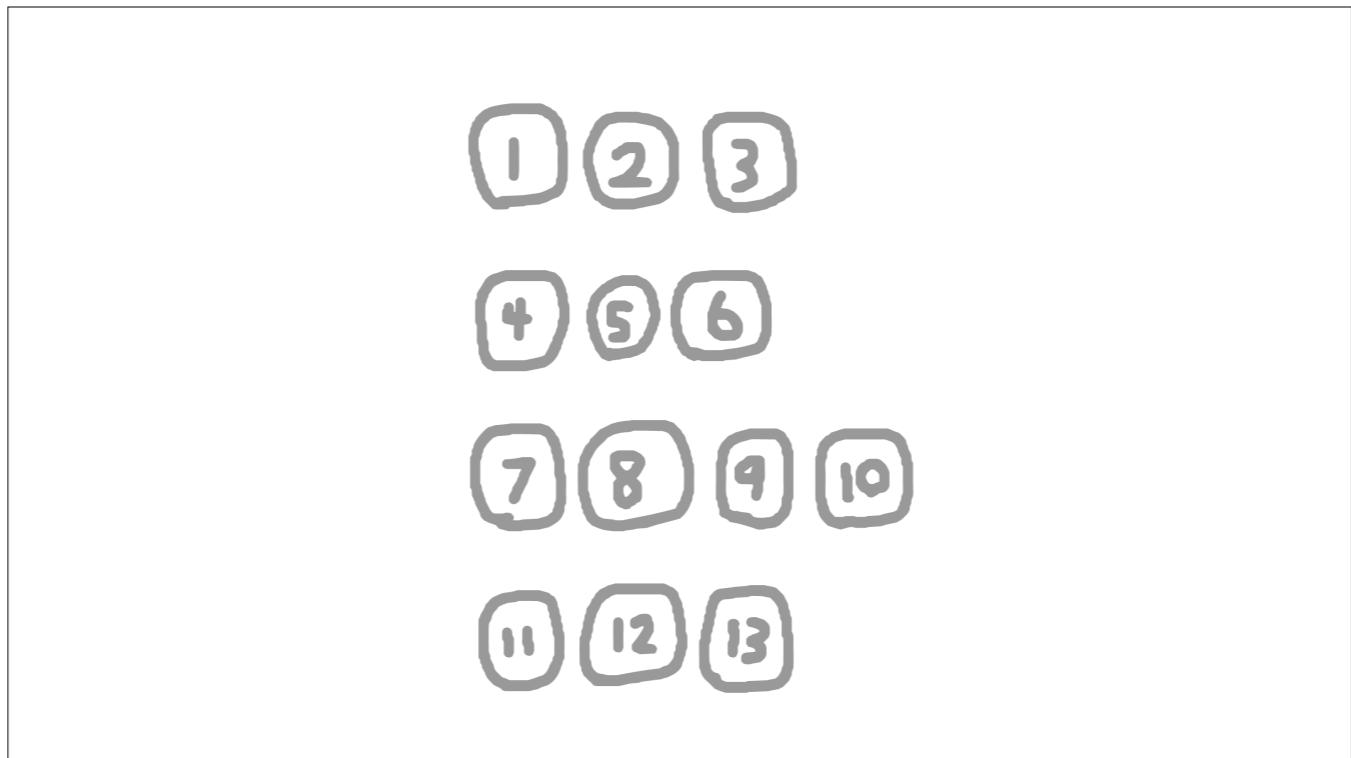


Well, we know! FOUR PLUS OR MINUS ONE "CHUNKS". (We used to think it was seven plus or minus two chunks, but scientists realized we suck even more than that.) To demonstrate this limit, here, try to memorize the following list:

**XCN
NFO
XMSN
BCX**

EX CEE ENN. ENN EFF OH. EX EM ESS ENN. BEE CEE EX.

Yeah. Pretty hard, right? Don't take a photo, that's cheating. You can obviously tell this will be hard to memorize, because there's *no connection* between the letters...



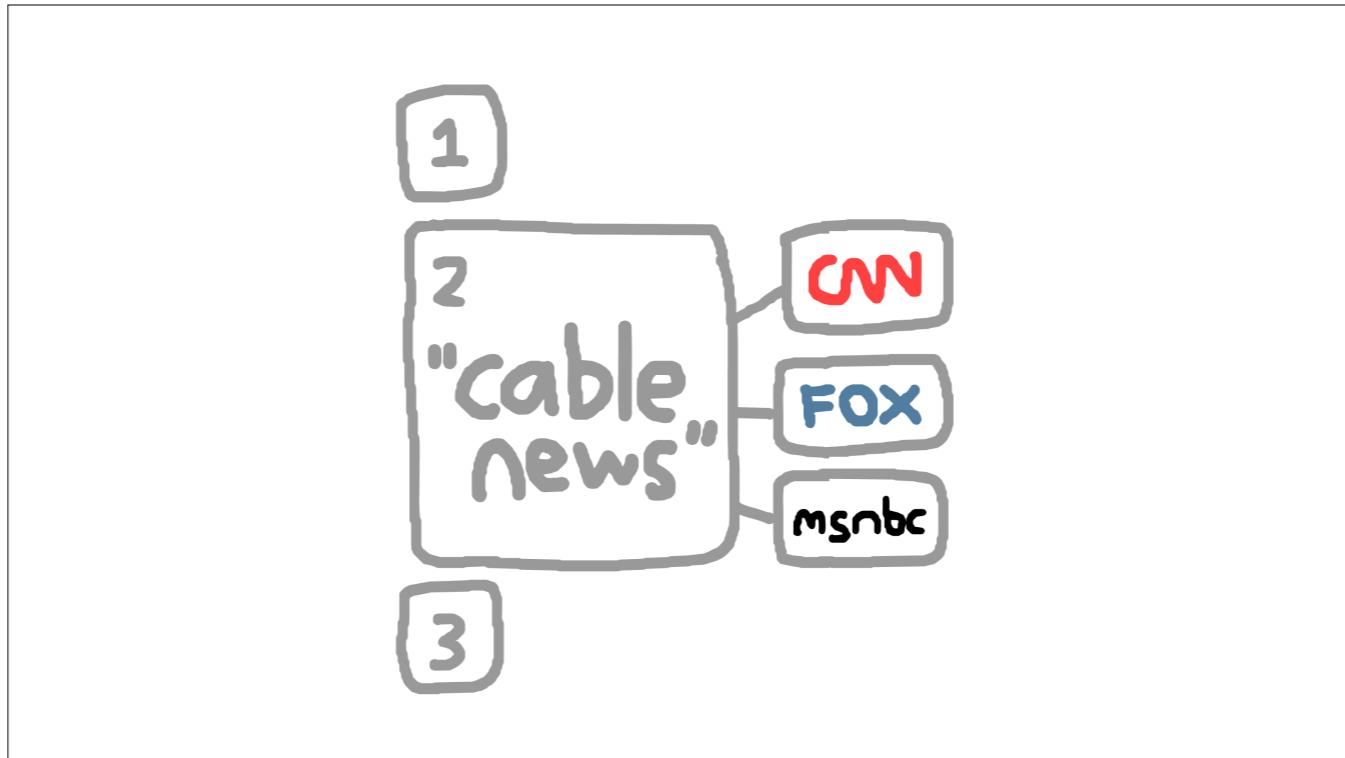
...which means, you have to remember thirteen *disconnected* chunks. That's *way* more than the four plus or minus one limit of our short-term memory. But now, try memorizing this following list...



X
CNN
FOX
MSNBC
X

EX. CEE ENN ENN. FOX. EM ESS ENN BEE CEE. EX.

If you're American, this list is MUCH easier, because you can clearly see the connection between the letters. And so, instead of thirteen chunks, you only need THREE chunks:

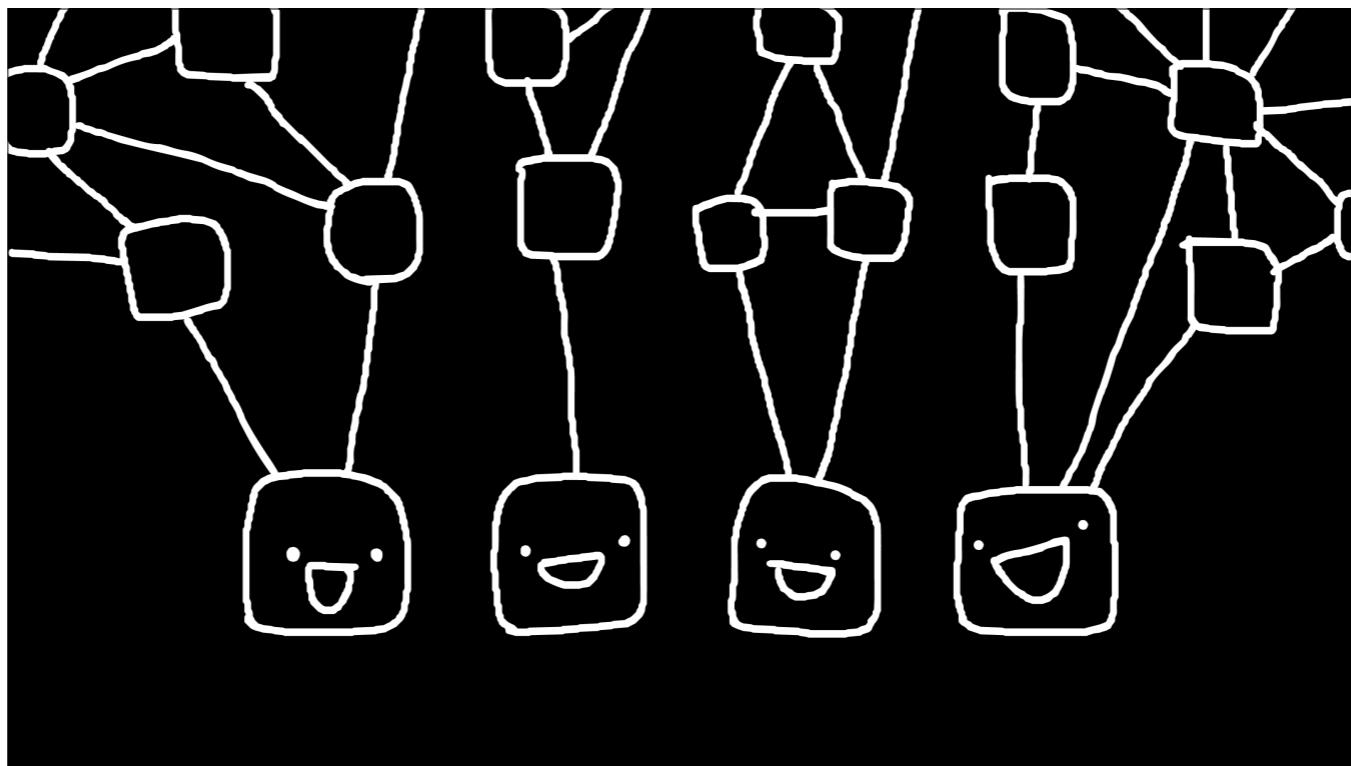


EX. CABLE NEWS. EX. Then – here's the trick – your brain connects the "cable news" chunk in your short-term memory, to the three names stored in your long-term memory! That's why the second list is much easier to remember than the first...

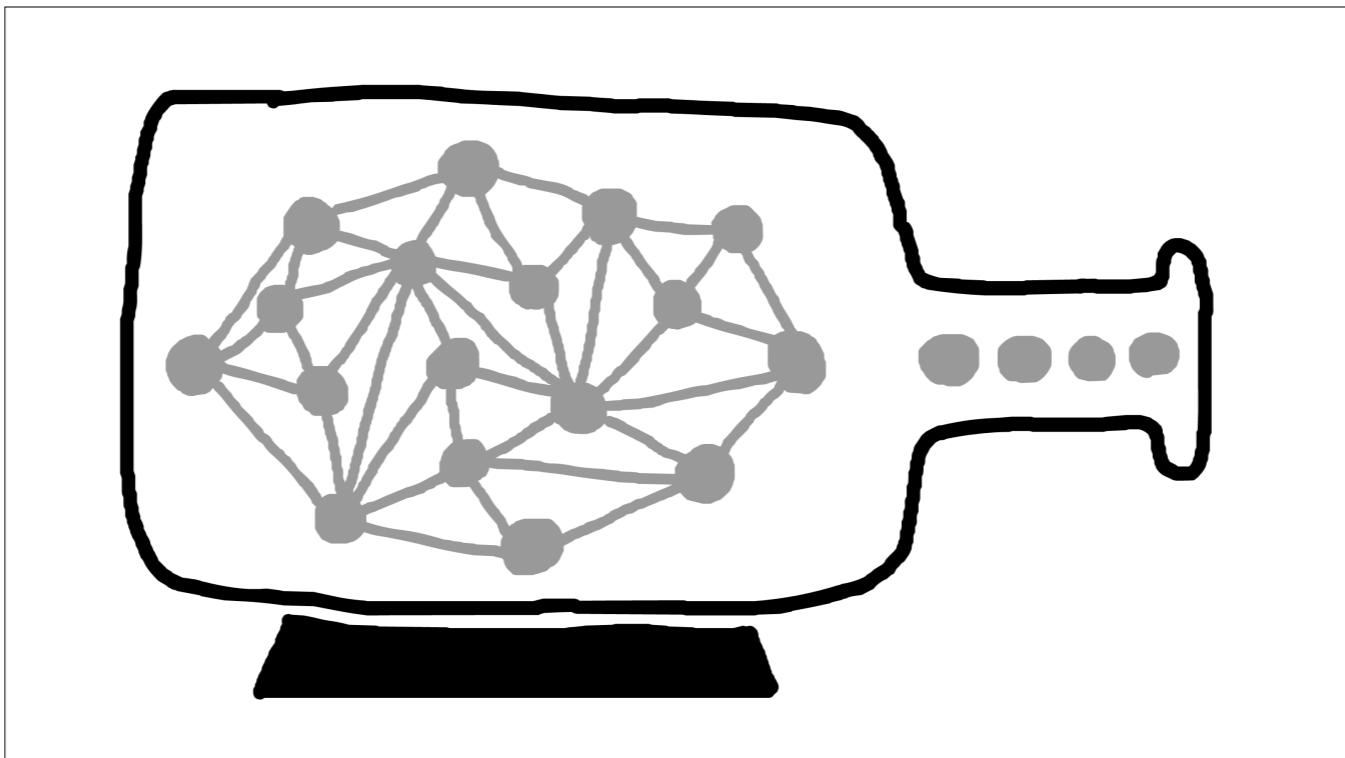
**XCN
NFO
XMSN
BCX**

**X
CNN
FOX
MSNBC
X**

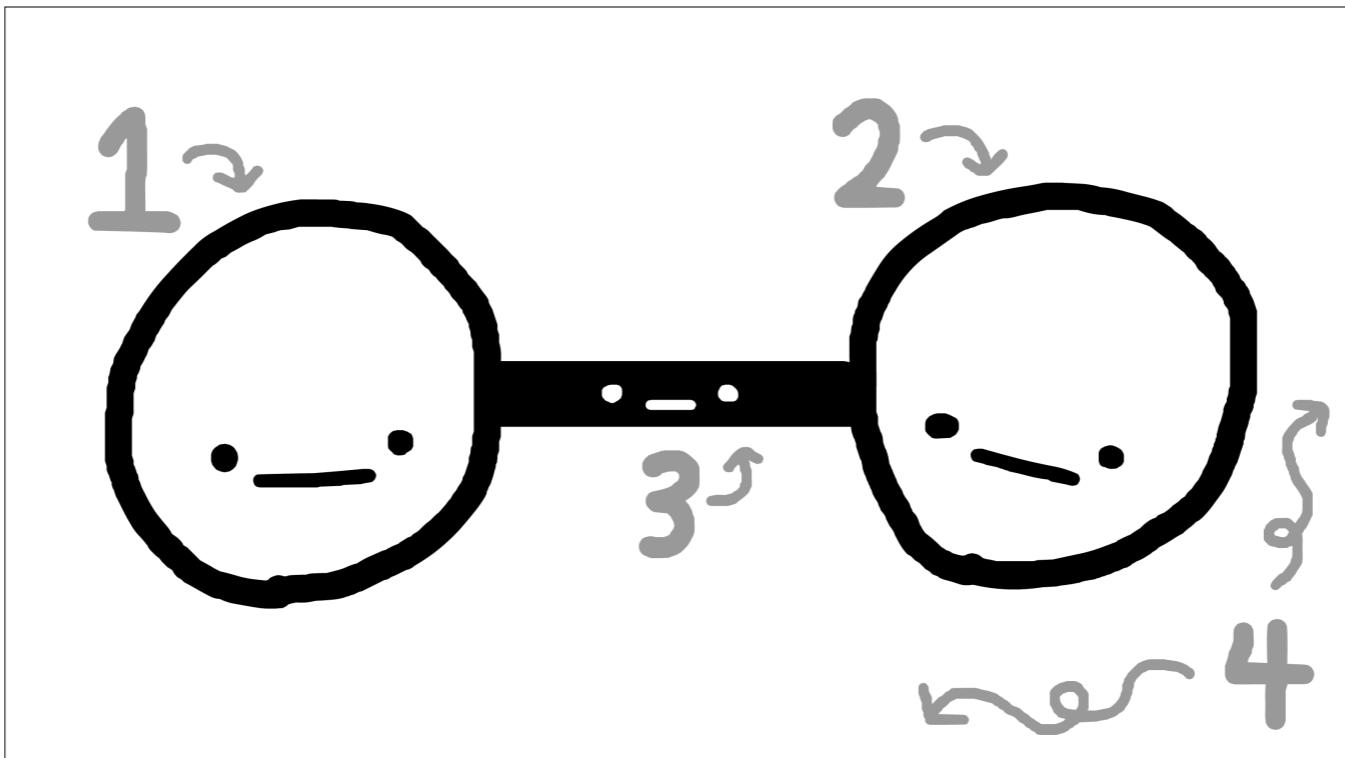
...even though... can you see it? They're the EXACT SAME LETTERS IN THE EXACT SAME ORDER. [beat] That's the sound of your mind being BLOWN. This demonstration proves it: understanding is ALL ABOUT MAKING CONNECTIONS.



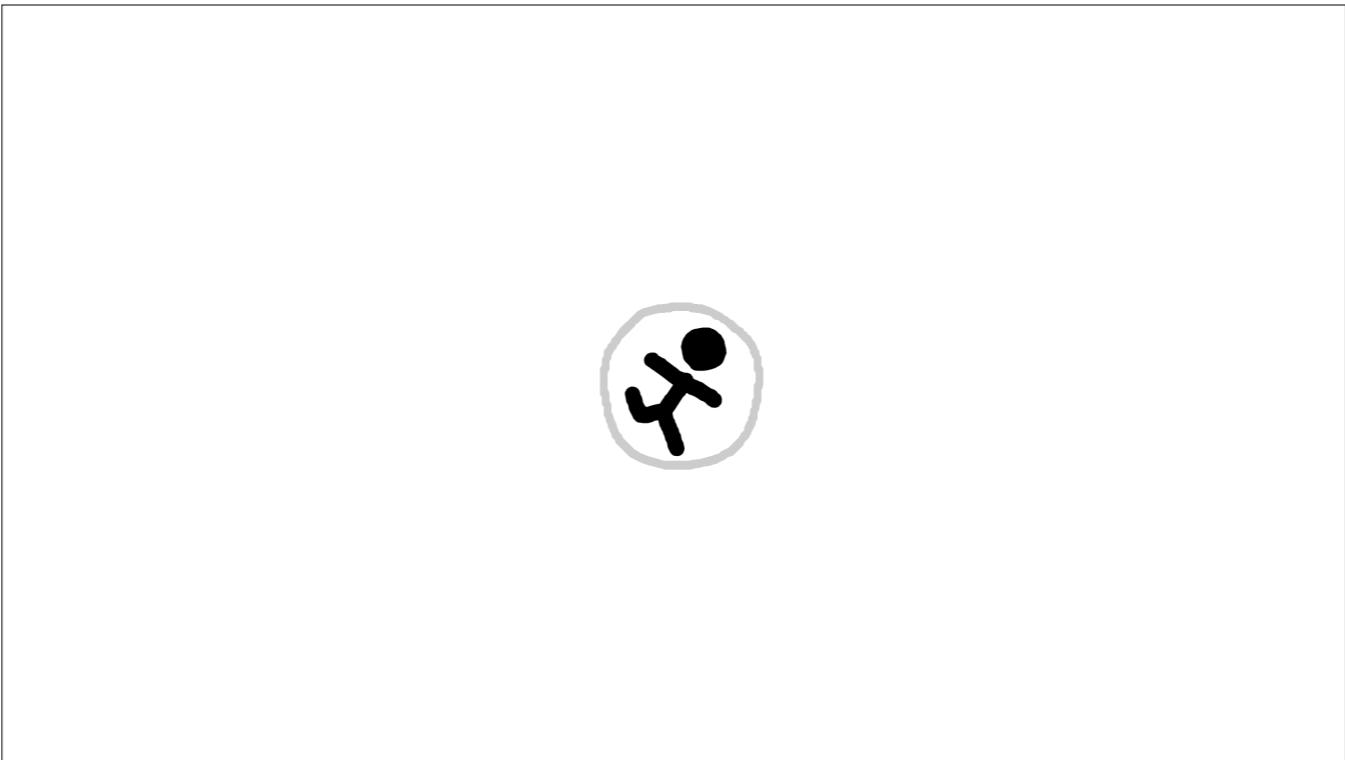
That's why we can do complex things like code, design, or make art. Coz although we can only hold four chunks in short-term memory, those chunks can be connected to far, far bigger networks in long-term memory.



So whenever we help a player learn a complex system, it's like building a ship in a bottle. We want a complexly connected thing on the inside, but the bottleneck only lets through four chunks at a time. So the trick:

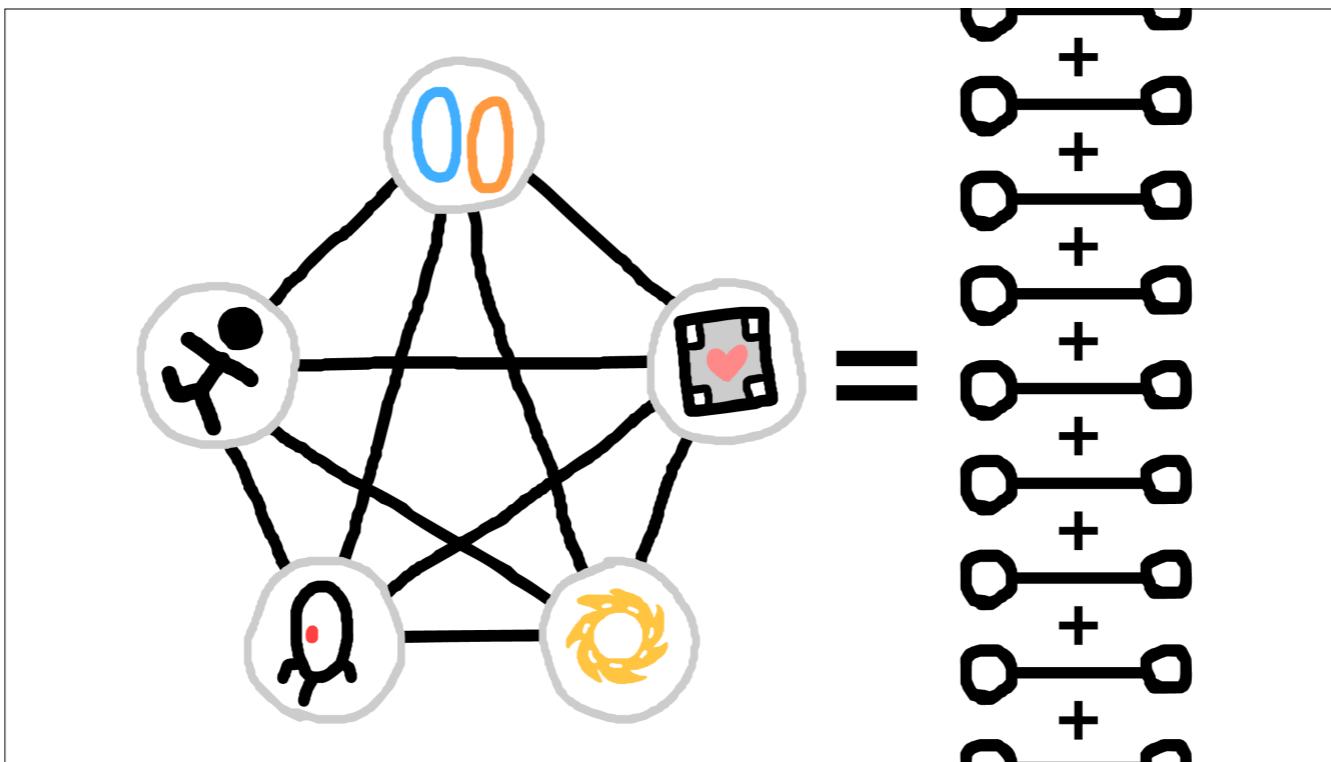


TEACH THE PLAYER ONE AND ONLY ONE NEW CONNECTION AT A TIME. That'll take four chunks. One old idea, one new idea, a connection, and some distractions. Build a network, one connection at a time. Here's a concrete example from the famously complex game, Portal:



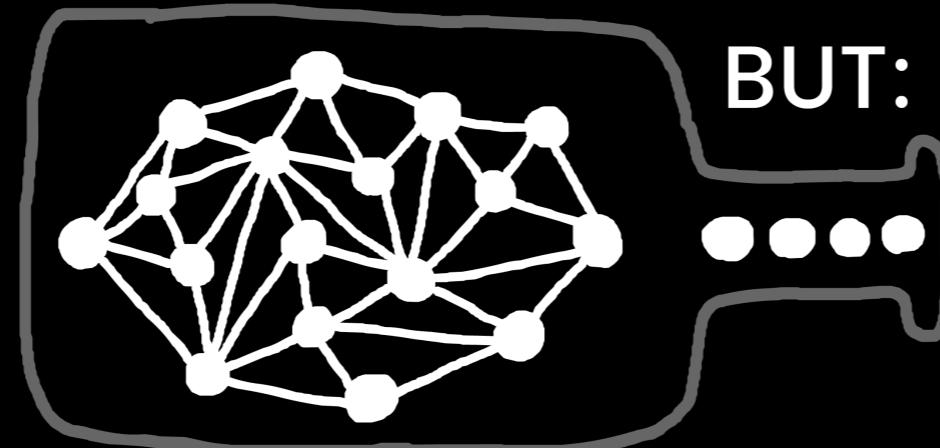
[[The above is a GIF and will not play in the PDF. Check this URL instead: <https://i.imgur.com/lBHja2L.gif>]]

Introduce player. Introduce portals. You can go through portals. Introduce cubes. They can be picked up, and go through portals. Introduce energy balls. They can kill you, go through portals, be deflected by cubes. Introduce turrets. They can kill you, go through portals, get knocked over by cubes or energy balls. AND SO ON



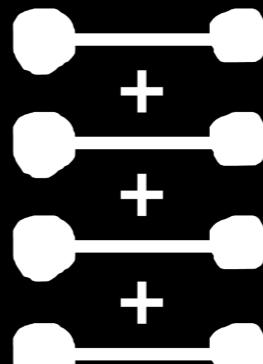
[BREATHE] Build a rich network in long-term memory, through one connection at a time in short-term memory. This strategy works for any kind of game where you need your player to understand a rich, complex system.

WE WANT:



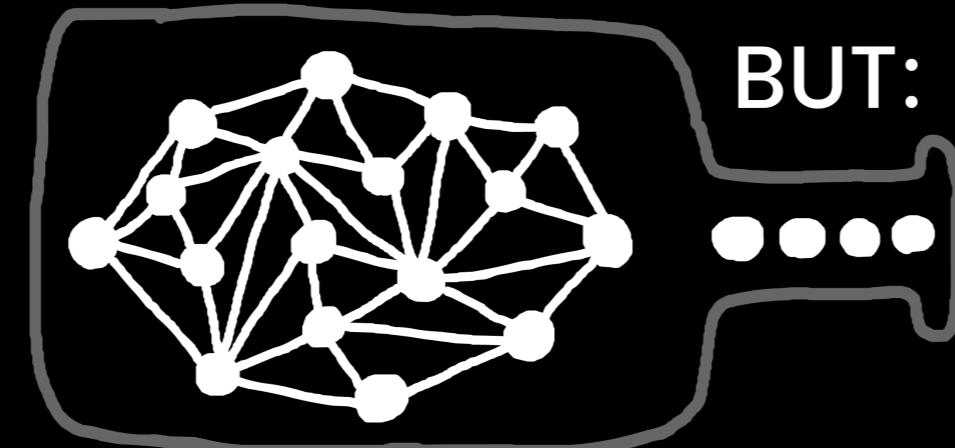
BUT:

THERE
FORE:



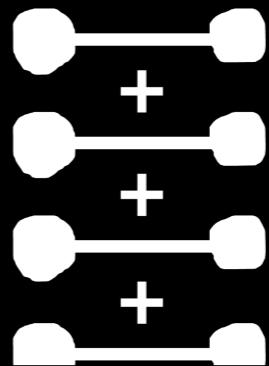
By the way, if you want to take a photo, this is it. Here's the summary slide. I even duplicated this slide so you have more time to take a photo. So, IN SUMMARY: We want a complex network in a player's long-term memory.

WE WANT:

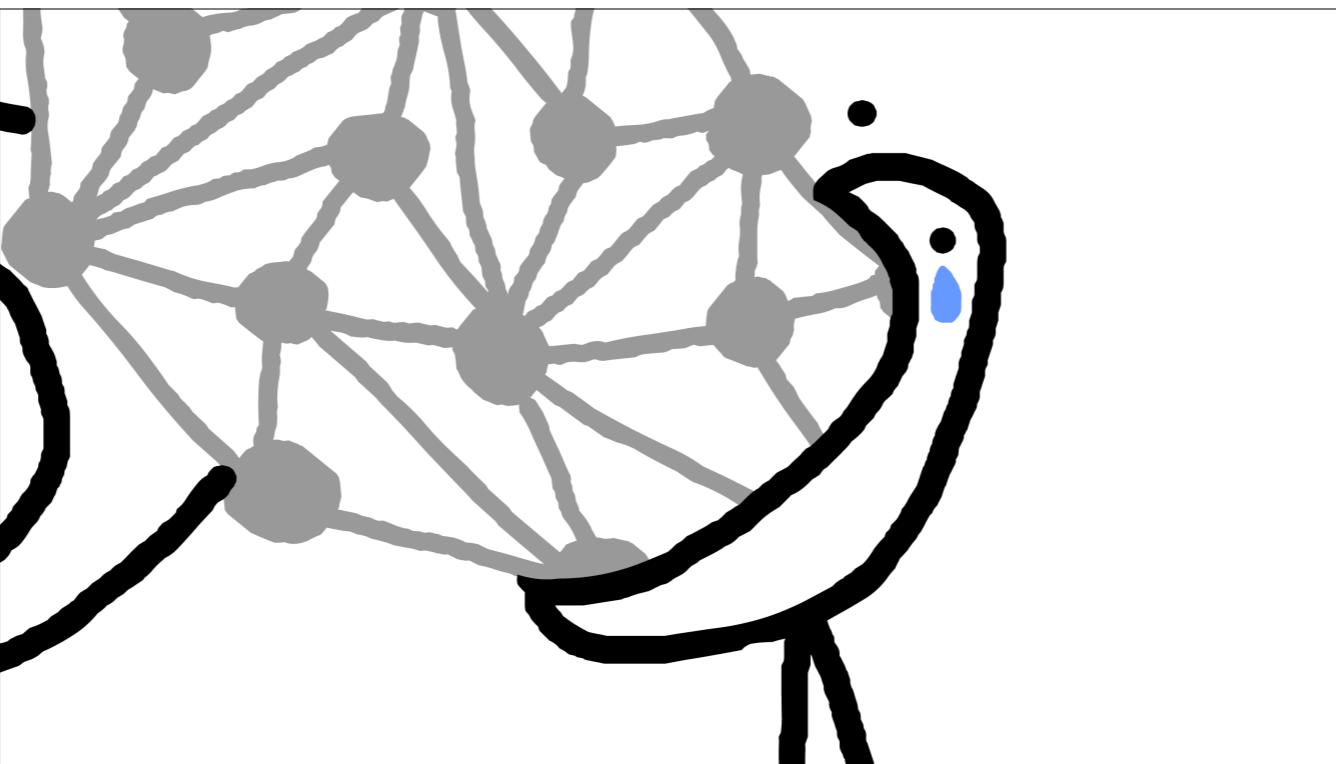


BUT:

**THERE
FORE:**



BUT they can only fit four plus or minus one chunks in short-term memory. THEREFORE each section of your game should teach ONE and ONLY ONE new connection at a time. Do this, and your players will be grateful that you're not doing ...



...this. Don't frontload tutorials, don't give walls of text, don't overwhelm mortal minds. Use cognitive psychology wisely, and you can help your player consume a complex system the same way you'd consume an elephant – one bite at a time.

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