

Episode 27: Mental Models

Show Notes

If you are an experienced gamer, you have seen that you can pick up a new game much more quickly than someone who doesn't have as much gaming experience. Why is that? We discuss both the benefits and detriments of mental models in this podcast.

Game References

Boon, Briscola Chiamata, Cyberpunk 2077, Filler, Sheepshead

Research References

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Transcript

Hello! This is Episode 27 of the Cognitive Gamer podcast. I am your host, Dr. Stephen Blessing, a professor of psychology at the University of Tampa. I use games to both explain and explore concepts in psychology, particularly cognitive psychology. I was recently over at a friend's house to play Secret Hitler. While waiting for the other people to get there, I was looking through their small but growing collection and saw a small box game I hadn't seen before. The game was called Filler, and after making the obvious joke that it looked to be literally a filler game, I opened the small box and took a look at the cards. It has a baking theme, and from my quick look at the cards, I remarked that it looked like a set collection game. My host didn't quite know what that meant, and I quickly explained that it looked like you had to get groups of cards in order to score points. He replied that's roughly it, that you had to get certain ingredients in order to make the recipe. We didn't play the game, but I believed I would have picked it up pretty quickly, first because it's not meant to be that complicated of a game, but also because just with a quick glance at the cards I was able to figure out some amount about how it's played. By

labeling it as a set collection game (and I see on boardgamegeek.com that it has a few more wrinkles than that), I'm able to tap into what a cognitive psychologist might call a mental model in order to help me learn and play the game. Let's talk a little more about these mental models that we all have in order to understand and make sense of the world around us, including how to play games.

Mental models share a lot, from a theoretical point of view, with another concept we've talked about here, schemas. Both mental models and schemas are previously acquired knowledge that help us to organize the world. Schemas tend to get talked about from a memory point of view, examining how they can help us organize our memory knowledge. Mental models are usually discussed around problem solving and decision making, as they help guide us through those processes. But, at a fundamental level, they both allow us do the same basic thing, of helping us to pack information into organized chunks for later retrieval and use. Let's concentrate now on how mental models can help us make decisions within the world.

I've been interested in games and video games for most of my life, and really into hobby boardgames the last few years. In that time, I've acquired a lot of knowledge about how games work. Some of you have more experience than I do, particularly in certain types of games. A lot of this knowledge, both yours and mine, can be thought of as being in a mental model. When I described Filler as a set collection game, I can use my mental model of what that all entails to help me learn and play the game. This can be a big leg up on more complicated games. When I hear that CD Projekt Red's new Cyberpunk 2077 video game is going to be a first person role playing game with different classes and skill trees, that gives me a lot of information about how the game plays. This goes a little bit beyond just schemas, because it's not just memory, as it also gets into actually making decisions in the world. Because the game has skill trees, I'm going to expect to see and play the game in particular ways, due to my past experiences in playing games with such skill trees. I know that I'll be limited in what I can do early on, that I'll gain new powers as I play, probably by spending something like skill points, and that these powers will go in a certain progression. Furthermore, I know that I can probably approach the game either by being a generalist, learning a lot of the basic skills across the categories, like combat, stealth, and others, or maybe I'll want to specialize deeply into one particular area. I haven't been scouring the internet for Cyberpunk 2077 information, but I would be pretty surprised if that isn't too far from the mark. Indeed, I just googled it, and I think I'm pretty close. Indeed, I see something that one of the developers is describing as a "fluid class system" where you can select between different skill trees. If I ever decide to play Cyberpunk, I'll have a leg up on someone who has maybe never played that type of game before, because I already have this mental model of how these games are supposed to play that I can use to help me get started.

The idea of mental models goes back actually to the early 1940s, with a philosopher and psychologist by the name of Kenneth Craik. The more modern spin starts in the early 1980s, when two different books came out with the title Mental Models, one by Philip Johnson-Laird and an edited volume by Dedre Gentner and Albert Stevens. That last book has a chapter by Don Norman, who many of you I imagine are familiar with and who I talked about in Episode 13. And, if you're familiar with psychology, other notable psychologists also wrote chapters for that volume. It was a big idea at the time, and people definitely wanted to be in on it. The notion that Craik had back in the 1940s is pretty consistent with the general idea as it manifested in the

1980s, and as it is still understood today. As indicated above, all these researchers had this idea that a mental model is an internal structure that we create and operate upon to model some real-world phenomenon. The power comes from the idea that these models are being constantly updated as new information is gathered. Also, particularly as they are being formed initially, they will be incomplete and probably wrong. This gives a reason for why humans might give wrong answers and make mistakes. But, as we test our ideas, they will get better over time. You can see where a designer like Don Norman would be excited about mental models, because they can help explain how someone will come to understand a physical device and how that understanding changes across time.

An example I like to talk about in class revolves around mental models of high blood pressure. Daniel Meyer, Howard Leventhal, and Mary Gutman actually did a study similar to this back in 1985. I ask my students what they believe causes hypertension. I'll get answers like lack of exercise, diet, and genetics. All of those are right answers, but people tend to have mental models of hypertension that emphasize one of these more than the others. If you go for your annual physical and you find out your blood pressure is a bit high, what you do will depend on your mental model of what causes hypertension. If you believe exercise is a big contributor, you might start heading to the gym more often. But, if you believe it's mostly genetics and your high blood pressure is mainly because your mom suffers from it as well, then you may just resign yourself to your fate and seek a drug therapy. I really like that example, as it's a real-world example of how people's mental models hit the road with their real-life, and perhaps very consequential, behaviors.

Let's go back and see how mental models might affect how we learn and play games. I haven't talked too much about card games on here, but I do like to play them. In particular, I really like trick-taking games, like spades or euchre. After playing hundreds, thousands I'm sure, of rounds of various such games, I have a pretty good mental model of how trick taking games should work and how players should play their cards. If you were to introduce a new trick-taking game to me, as soon as you described it as a trick-taking game, I would be able to bring that knowledge to bear in helping me learn the game and figure out a good strategy at playing my cards. Many trick taking games have a trump suit, so that's part of my mental model as well. I might ask if the trump suit in this game is called, fixed, or determined by chance, because those are variations I'm aware of in different games. That is, it's part of my mental model.

Shut up and Sit Down, as part of their Card Games That Don't Suck series, described a game called Briscola Chiamata. As they were talking about the game, the rules are very similar to another card game I know quite well, Sheepshead. I turned to the internet to figure out how an Italian game was so similar to a German game, and it turns out there's a whole class of games that come from that large area of Europe called Ace-10 games, of which both games are a part. The name Ace-10 comes about because how they are scored. Wikipedia lists about a dozen such games, and I imagine I could come up to speed quickly on any of them, given my mental model of Sheepshead. Briscola Chiamata is essentially Sheepshead but with an initial auction mechanic to determine what the bid is; Sheepshead has a fixed number of points you need to get each round.

As an aside, as I was researching for this podcast, I came across a modern version of Sheepshead. The game was created by Alex Lau and is called Boon. The game plays identical to Sheepshead, or as a cognitive psychologist might say, Sheepshead and Boon have isomorphic problem spaces. Alex created Boon to make the gameplay of Sheepshead easier to teach. Sheepshead has a lot of weird rules, like all queens, jacks and diamonds being trump, with the Queen of Clubs being the most powerful card in the deck. But, it's only worth 3 points, like all the other queens. Kings are worth 4 points, but again, won't beat a queen, because kings are not trump (well, except for the king of diamonds). Sheepshead is tough to teach, because it breaks a lot of mental models, even if you are familiar with other trick taking games. Boon's specially created deck makes it easy to see what cards are trump, how many points each card is worth, and what rank each card is. Boon, in other words, plays into many people's existing mental models for trick taking games, and, I believe even if you aren't that familiar with other similar games, makes it much easier for a novice to learn the game, creating the proper mental model along the way. My Boon deck is on its way, and I'm looking forward to trying out that experiment!

As mentioned above, one feature of mental models is that they change as new information comes in that contradicts the current state of your mental model. There's a classic study by Joseph Nussbaum which examines how children acquire mental models about the earth, and how those mental models change across time. Very early on, due to their everyday experiences, kids will conceptualize the earth as flat. It sure looks flat, particularly here in Florida. But, soon they encounter information like seeing a globe on a desk or pictures that a satellite has taken of the earth. They start to try to reconcile their model of a flat earth with this new information. Many kids will update their mental model to maybe have 2 earths, the flat one that we live on, and the round one that the astronauts see. Eventually though they will modify their mental model to have only the singular round earth that we all live on. But, there's this long transition period to allow that to happen, as new information comes in. I imagine I went on a similar transition as I learned my first trick taking game, probably Hearts, to where I now know quite a few and can appreciate the larger space of rules that such games can occupy. It might make for an interesting study to see how game player's mental models evolve across time.

Mental models can help a lot then as you pick up a new game, as you can use past knowledge to help you pick up the new knowledge. However, they can also get in the way. To stick with trick taking games, they can differ as to the strategy of when you want to play a card high in rank in order to take a trick or when you may just want to get rid of a weak card or a card that gives points. The game you are learning might be best played by one of those strategies, but you start to follow a different one. Or, you might have as part of your mental model for trick-taking games that you always have to follow suit, and if you don't have the suit, you must play trump. But, not all games have those types of rules. If you persist in playing that way, you are placing restrictions on yourself that may be making the game harder to win. So, mental models don't always help, they can also hinder. Indeed, Don Norman in his book *The Design of Everyday Things* provides lots of examples of mental models getting in the way of successful operation of various devices. An interesting case of mental models causing wrong answers also shows up in the cognitive psychology literature in an area of research referred to as naïve physics. Naïve physics are these rules that we all have for how physical objects are supposed to behave out in the world. We tend to have a pretty good sense of such things move and behave, but not always. An interesting question used in research by Mary Kaiser and her colleagues to show how mental

models and our naïve physics evolve over time is to ask elementary school kids what happens to a ball after it shoots out of a spiral tube it's been travelling in. Does it continue along in a spiral, once it leaves this tube, or does it start travelling straight? The data show this interesting U-shaped data, where very young kids get it right, like kindergartner age, but a dip in right answers in 3rd and 4th grade, and then picking back up to where college students do as well as the kindergartners. In these elementary grades these kids are adding to their physics knowledge, which mostly helps them, but does lead them astray, like in this problem.

Let me give you another example from board games. I've seen where a lot of people think Scythe is a wargame, given how it might look from a quick glance, or if you're not familiar with that larger class of strategy games or if you are just familiar with Risk or something like that. If you try to play Scythe like Risk, you're not going to get very far. That would be a faulty mental model.

When you learn your next game, consider how you are using your mental models, that previously acquired game knowledge, to help you learn the game. How did your mental model help? Or did it maybe cause you to make a mistake or play inefficiently? On balance having mental models can give you a big assist in learning a game, but there can be a bump or two in the road as your mental model might not be complete or it's faulty, in the sense that it doesn't cover every situation that may come up, or perhaps it's too specific.

That brings us to the close of this episode. As always, I welcome any comments or questions you may have, so please email me, steve@cognitivegamer.com and also visit my website, cognitivegamer.com. Also, you can like me on Facebook, Cognitive Gamer, or follow me on Twitter, [@cognitive_gamer](https://twitter.com/cognitive_gamer). And, if you like the podcast, please give a rating in whatever service you use to play podcasts. This will make it easier for other people to discover. Until next time, remember to think about what you play, and have fun doing it.