

Retiring the Dreyfus Five-Stage Model of Expertise

The five-stage model of how expertise develops (Dreyfus & Dreyfus 1980) has been extremely influential. It is cited in a wide variety of contexts.

And it is a very compelling story. Novices start out by learning the rules because that's all novices can do—rigidly adhere to the rules they've been taught. Then they start gaining an appreciation of context, start building routines, adopt more general-purpose maxims, see patterns, and appreciate the connections between different aspects of the work.

Eventually, the novices may evolve into experts: they would no longer rely on rules, guidelines, and maxims. Instead, they would intuitively size up situations.

I played a small role in this five-stage model—I was a research psychologist with the Air Force Human Resources Laboratory 1974 to 1978 and I recommended to Major Jack Thorpe, who was then at the Air Force Office of Scientific Research, that he look into the work of Hubert and Stuart Dreyfus. Thorpe became excited about the potential of their framework. He arranged funding for them to study F-15 pilots at Williams Air Force Base, and that opportunity grew into the five-stage model.

I have been a fan of Bert and Stuart's work for many years. Bert's 1972 book *What Computers Can't Do* was a critical influence on my thinking about expertise and [decision-making](#).

However, I recently began to wonder some aspects of the five-stage model were perhaps based on a confusion. The starting point is rules—the rules taught to novices, the rules novices blindly follow until they start to gain more experience.

But what do we mean by "rules?" We might mean the explicit rules to be followed. A chess beginner has to learn the names of the pieces, the ways they can move, the ways they can capture the opponent's pieces, and the end point of the game, to capture the opponent's king. Plus a few more rules about how to castle, and the requirement to call "check" if the opponent's king is under attack. All players have to carefully follow these rules. They are the *legal* rules of the game.

Another definition of "rules" is to specify the steps to follow to achieve an outcome. The legal rules listed in the previous paragraph don't do anything like this. In fact, novice chess players aren't given much if any guidance about tactics and strategy. There aren't any rules to direct a novice in how to play chess. Novices can read books about openings but are quickly overwhelmed by the possibilities.

Novice chess players might like some guidelines—some "tactical" rules—but there aren't any. Similarly, fighter pilots preparing for air-to-air combat aren't trying to follow

rules. The Dreyfus five-stage model runs into trouble from the very start.

My sense is that chess novices are working very hard to solve local problems—to capture opponent pieces and to avoid getting their own pieces captured. They want to pounce on the adversary's carelessness and they worry about their own carelessness, the pieces they leave unguarded. These games are essentially exercises in attrition warfare, trying to build up an advantage in material and then, in the endgame, attempting to simplify the position in order to achieve a checkmate. Chess novices aren't told about tactical rules and aren't following tactical rules.

Why does this matter? I have seen training developers embrace the Dreyfus five-stage approach because it encourages them to start with rules, and then they make up tactical rules even where none exist. As a result, trainees may learn dodgy rules that they will only have to unlearn later on.

Therefore, using the five-stage model could actually delay the growth of expertise by force-feeding spurious tactical rules instead of trying to help novices get a feel for the activity. Think back to the demonstrations by Timothy Gallwey (*The Inner Game of Tennis*) showing how to teach novices to play the game without giving them any guidance, just by helping them find a rhythm for synchronizing the movement of the ball, the movement of their bodies, and the arc of the swing. Similarly, no one tells us the rules for riding a bicycle. We just venture out and get a feel for how it works.

Let me describe my 6-year-old grandson Koby, who is right-handed but is more comfortable playing baseball using a left-handed stance in the batter's box. His father Matt and I realized that the left-handed stance was basically a two-handed backhand in tennis. So when we started playing tennis with him this summer, we hit the ball to his backhand side and he naturally used his two-handed approach to blast the ball over the net. We never told him anything about how to hold a racket or how to hit a two-handed backhand.

And what about the stages? Gobet and Chassy (2009) have asserted that there is no empirical support for the stages posited by the Dreyfus and Dreyfus model. I am also skeptical about the plausibility of stages. It seems as if competence and expertise are gained continually as players build a repertoire of patterns and affordances. Novices may be engaging in the same kinds of [cognitive](#) activities as competent players, only with restricted pattern bases. Trainees naturally progress as they acquire more patterns (e.g., Chase & Simon, 1973).

The evolution Dreyfus and Dreyfus describe still makes sense to me: moving toward a greater reliance on [intuition](#), as I have described in the Recognition-Primed Decision (RPD) model (Klein, 1998). It's just that there is no obvious benefit from postulating different stages of cognitive activities. I suppose we can interpret the Dreyfus stages

as snapshots of progress, but that's not the same thing as identifying them as separate stages of cognitive development.

Some domains do depend on procedures, and these can be thought of as the tactical rules Dreyfus and Dreyfus had in mind. For example, in setting up scenario-based training for police officers, my colleagues and I have learned that cadets in an academy aren't ready for sophisticated decision-making. Instead, they are trying to master basic routines—how to flag down an errant driver, how to handcuff someone, how to direct traffic around an accident. These routines are the building blocks of skills. Until they become pretty automatic, a police officer won't have much attentional capacity for handling complications.

In addition to law enforcement, other domains I have recently studied (nursing, child protective services, operating a petrochemical plant) emphasize procedures—the rules to follow to get the job done. So perhaps in these kinds of work settings, the five-stage model of expertise development does apply.

Except that in these settings the trainees are not encouraged to move to the higher Dreyfus stages. Instead, they usually come away with the belief that their job is to learn the procedures really well. One police officer explained to me that she was trying to add more procedures to her toolbox. Her attitude shows a procedural mindset: expertise is a matter of acquiring more procedures.

As Bert and Stuart Dreyfus have noted, no amount of procedures will be sufficient to handle the work in complex settings. In our projects, we found that the effective decision makers have learned to be ready for challenges that aren't covered in the procedures. They have shifted from a procedural mindset to a problem-solving [mindset](#), detecting potential problems and adapting to cope with them.

Unfortunately, this mindset shift does not reliably emerge with experience. The five-stage model suggests that with experience, people will cease relying on rules/procedures. However, it's just the reverse. Too often the decision makers remain anchored in the belief that it's all about mastering more procedures. As a result, their mindset holds them back.

Even though I think it is time to move on from the Dreyfus five-stage model, I am [grateful](#) for what it has contributed, how it has spotlighted different facets of expertise, described the limitations of procedural approaches, and emphasized the importance of tacit knowledge. Models can contribute value without having to be maintained in perpetuity and good models help us find ways to move beyond them. Of course, the Dreyfus model will stick around until a better model comes along to replace it, but that's another story.