

Revisiting the Six Stages of Skill Acquisition

Penultimate Draft. Please quote the published version in *Teaching and Learning for Adult Skill Acquisition: Applying the Dreyfus & Dreyfus Model in Different Fields*, edited by Elaine Silva Mangiante and Kathy Peno (Information Age Publishing, 2021)
<https://www.infoagepub.com/products/Teaching-and-Learning-for-Adult-Skill-Acquisition>

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Abstract

The acquisition of a new skill usually proceeds through five stages, from novice to expert, with a sixth stage of mastery available for highly motivated performers. In this chapter, we re-state the six stages of the Dreyfus Skill Model, paying new attention to the transitions and interrelations between them. While discussing the fifth stage, expertise, we unpack the claim that, “*when things are proceeding normally*, experts don’t solve problems and don’t make decisions; they do what normally works” (Dreyfus & Dreyfus, 1988, pp. 30 – 31). This leads us to offer an account of the “perspectival deliberation” that arises for experts and masters and that is distinct from the calculative deliberation characteristic of the lower stages of skillfulness.

Introduction

The acquisition of a new skill usually proceeds through five stages, from novice to expert, with a sixth stage of mastery available for highly motivated performers. This account was originally proposed by Dreyfus & Dreyfus (1980) and was expanded and refined in Dreyfus & Dreyfus (1988) and in subsequent writings. Here we re-state the six stages, paying new attention to the transitions and interrelations between them. In the course of our discussion about expertise, we also unpack the claim that, “*when things are proceeding normally*, experts don’t

solve problems and don't make decisions; they do what normally works" (Dreyfus & Dreyfus, 1988, pp. 30 – 31, italics modified).

As the contributions to this volume attest, the account we defend is general, meaning that it holds both for everyday skills, such as driving a car or walking a city sidewalk, and for specialized, or so-called "elite" skills, such as playing a musical instrument, firefighting, nursing, teaching, or playing baseball.¹ People often think of "experts" as those who are particularly good at performing elite skills. However, on the account we offer here, expertise is a stage of performance attainable for everyday skills as well. The account we offer is generalizable in this way because it is grounded in a basic tendency of human intelligence and agency, namely, that with experience, human beings tend to develop a holistic, intuitive *familiarity* that immediately guides and orients their action in a domain (see Dreyfus, 1992, pp. xxviii - xxix). To be intuitively familiar with a domain is to know how to get around in its typical situations, to be able to anticipate and smoothly respond to events as they unfold, without having to calculate or deliberate. On our account, this ability comes to fruition in the fifth stage of skill acquisition, expertise. Moreover, to know how to get around in typical situations is to be responsive to the *salience* that things take on in a situation, such that certain elements stand out as important and relevant, while others recede into the background and are able to be ignored. In the terminology we use below, to have this kind of familiar orientation in a situation is to be involved in it in light of an *intuitive perspective*. An intuitive perspective emerges for performers beginning with stage four, proficiency.

Such is the phenomenology of mundane experiences from walking down a crowded city

¹ We agree with Christensen, Sutton, & McIlwain (2016), and disagree with Montero (2016) and Ericsson (2006), in finding a fundamental continuity between everyday skills and specialized (or "elite") skills. The continuity lies in the tendency for experienced performers to develop an intuitive familiarity that guides them in coping with typical situations.

street to coping with the furniture and equipment of familiar rooms. When walking down a sidewalk in a crowded street in a familiar city, the movement of our bodies, our stepping up and down curbs, pausing at busy intersections, and our anticipatory evasion of approaching pedestrians who are competing for the same sidewalk space all normally happen without our needing to calculate or deliberate. Now, consider too the difference between the way an expert cook and someone with little to no cooking experience relate to the contents of a pantry filled with various canned goods, fresh vegetables, and herbs. The experienced cook will see ingredients relevant to an ensemble of dishes and sauces and will already be able to anticipate the first moves required for preparing a meal, as well as the order and timing in which to approach the subsequent steps (e.g., heating the oven, prepping the herbs, chopping the vegetables, readying the food processor). The novice with little experience, unable to differentiate sage from basil, jicama from radish, or quinoa from bulgur, will confront an inventory of strange items and will require either the guidance of an instructor or of a recipe, including objective descriptions of ingredients and quantified procedures, in order to arrive at a plan for preparing a meal.

In order to advance to proficiency and expertise, the stages at which typical situations have become familiar and spontaneously make sense to the performer in light of an *intuitive* perspective, the learner has to become adept through experience. Gaining experience, learners become more and more sharply attuned and responsive to the typical situations of their skill domain. We have distinguished three initial stages (novice, advanced beginner, and competent) that, given enough experience and, for specialized skills, some degree of talent, are passed through on the way to proficiency and expertise. Lacking a sense of intuitive familiarity, performers at these earlier stages deliberately follow general rules, consciously apply maxims, and explicitly choose plans. Unfortunately, much of the literature on skill acquisition stops short

of dealing with proficiency and expertise and as a result presents a distorted, overly rationalized, picture of skilled agency.

From Novice to Expert

Stage 1: Novice

Typically, the learning process begins with the instructor (a teacher or instruction manual) decomposing the task environment into context-free features that the beginner can recognize without the desired skill. The beginner is then provided rules for determining actions on the basis of these features. Through instruction, the novice acquires rules for drawing conclusions or for determining actions based upon facts and features of the situation that are recognizable without experience in or familiarity with the skill domain being learned.

For example, the student automobile driver learns to recognize such domain-independent features as speed (indicated by the speedometer) and is given rules such as a formula for the safe distance at which to follow another car or a motorcycle as a function of the speed, or the amount of time to leave on one's turn signal before changing lanes. The novice chess player learns a numerical value for each type of piece regardless of its position, and the rule: "always exchange ... if the total value of pieces captured exceeds the value of pieces lost" (Dreyfus & Dreyfus, 1988, p. 22). The novice cook works from a recipe in which the preparation for a dish is decomposed into distinct steps, including pre-selection of ingredients, objective measurements for ingredient amounts, oven temperatures, and time intervals.

Being focused on rules and those features in one's circumstances that are relevant to the application of the rules, a novice performs in a largely individualized register. That is to say, novices are largely focused on the basic implementation of their own performance such that anticipating and responding to the involvement of others in the circumstances —other drivers

and pedestrians when learning to drive a car, for example, or the patient's family when training as a nurse, or the performance of one's teammates or opponents when playing baseball — is of secondary relevance. Even when other people are referred to in the rules that a novice is learning, they tend to be perceived as just another fact or feature to be taken account of in a detached way. Subsequent stages, especially starting with competence, are characterized by a more refined ability to attend and respond to the involvement of other people in a situation and to adjust one's own performance in line with one's anticipations of what they will do next (as when a competent driver in a hurry to arrive somewhere anticipates that the driver ahead is about to make a right turn and so decides to change lanes in order to avoid being stuck behind that driver).

The knowledge imparted to the novice is theoretical knowledge — knowledge of general rules and principles abstracted from involvement in the domain. In turn, the kind of deliberation the novice engages in — applying general rules to objective features of a situation — is what we call “calculative reasoning.” But, following general rules will produce poor performance in the real world, which is a repository of contingencies that may interrupt the flow of our activities. Only experience in a domain can give one a sense for the characteristic contingencies that may transpire and to which a performer must be ready to respond. Rapid, un-signaled lane-changes are often necessary for avoiding collisions when a distracted, neighboring driver careens into our lane; a chess player who always exchanges to gain points is sure to be the victim of a sacrifice by the opponent who gives up valuable pieces to gain a tactical advantage; required cooking times vary depending on the particular cookware one uses and the condition of one's stove and oven. The student needs not only the facts and rules for how to implement the skill, but also an experience-based understanding of the context in which these make sense.

The application of theoretical knowledge and the exercise of calculative reasoning depend upon certain already-acquired skills or capacities for discrimination that the learner brings with them from prior experience in other domains. For example, beyond a notification that items in a mirror may be closer than they appear, the novice is not given a rule for determining that what mirrors show is in fact behind you; it is presumed that a novice brings with them skills for dealing with mirrors, skills picked up by growing up in a culture in which mirrors are a familiar, everyday item. Nor are they given rules for distinguishing trucks from motorcycles or, in the kitchen, for distinguishing knives from forks. When we embark upon learning any new skill, we bring with us and rely upon a basic, global familiarity manifest in a suite of abilities and dispositions (Rousse, 2019) and background practices (Wrathall, 2017) for getting around amidst other people and in the typical situations of our everyday worlds.

Stage 2: Advanced Beginner

As novices continue to gain experience coping with real situations, their perception of their situation will be enriched in two main ways. First, they will become able to notice additional facts and features and to use more sophisticated rules for relating to these features. The driver, for example, will start to gain more familiarity with the various instruments and their read-outs in the car console: the fuel gauge, the seat-belt notification light, the radio station, the GPS system, the rearview mirrors, etc. This expansion of the registry of facts and features, however, involves no qualitative shift in the perception of the learner's circumstances beyond the novice stage. Rather, it amounts to an intensification of what a novice confronts, first, a proliferation of facts and features that might become relevant and vie for one's attention and, second, additional rules for relating to these facts, for example: When pulling out of a parking spot, first put on your seatbelt, then turn on the car and check the gas and notification lights, then

activate the turn signal, then check the mirrors, then put the car in gear and enter the roadway when it is clear.

The second way in which the learner's perception of their situation gets enriched by increased experience does amount to a qualitative differentiation from Stage 1. Beyond the registration of additional context-free *facts* and *features*, with enough experience with examples, the learner will begin to recognize what we call *situational aspects*, discriminable, recurrent phenomena that can be pointed out and named by an instructor or a mentor. Examples of situational aspects include the sound of a racing engine, the characteristic vehicle swerves and head tilt of a nearby driver who is texting on their phone, or, in the kitchen, the smell of burning olive oil. An advanced beginner, then, begins to cope not only with rules referring to context-free features, but also instructional *maxims* referring to situational aspects. The advanced beginner driver uses situational elements (the characteristic look of another driver's head-tilt when they are distractedly gazing down at their phone) as well as non-situational elements (current speed as shown in the speedometer) in deciding when to pass another car, or to back off and give them more room. He learns the maxim: Slow down and keep back when a nearby driver's head is tilted, looking down at their phone. The advanced beginner cook learning to prepare, for example, a marinara sauce, acquires the maxim: Reduce heat and quickly add in the garlic if you smell the olive oil starting to burn. The advanced beginner in chess begins to recognize overextended positions and to see how to avoid them. "Similarly, after much experience he can spot such situational aspects of positions as a weakened king's side or a strong pawn structure despite the lack of precise and universally valid rules" (Dreyfus & Dreyfus, 1988, p. 23). With this, the player can follow maxims such as: "Attack a weakened king's side" (Dreyfus & Dreyfus, 2008, p. 114).

In contrast to context-free rules, following maxims draws upon prior experience with and understanding of the domain where the maxim applies. Maxims frequently refer to abilities of discrimination which can *only* be gained experientially. No rule can explain how to pick up on the smell of burning olive oil. The learner becomes sensitive to the smell of burning olive oil not by explanations and definitions, but only by experience and indication of examples. A mentor leading someone in the development of a skill would do well to emphasize that one can experientially learn to pick up on such situational aspects *without being able to explain it* (Dreyfus, 2016). Further into the learning process, the limits of explanation will again become important. Eventually, an intuitive sense of a *whole situation*, including how one should respond, will begin to occur to the performer, again often without their being able to explain or rationalize it. Experienced cooks, who are not also experienced cooking instructors, for example, often find it difficult to explain their method of preparing a familiar dish, that is, to decompose their situational awareness and intuitive know-how into a series of discreet steps for a novice or advanced beginner to follow. Such difficulties with rationalizing or explaining skilled behavior presents a challenge to instructors and mentors, but it is not a failure. On the contrary, an increasing ability to see the limits—and ultimately to let go—of rationalized rules, procedures, and explanations is essential for advancing through the stages of learning.

For the advanced beginner, learning and performance tend to be carried on in a detached, analytic stance as the student, unsure of what to do, applies rules and maxims, follows instructions, is given examples, and reasons out what to do in a calculating way. The addition of many new elements (both additional context-free features and rules and new situational aspects and maxims) makes for a marked increase in complexity in the learner's situation. It is as though the learner's field of awareness has become more crowded with various elements needing to be

attended to and juggled, and with more and more rules and maxims. The task to be accomplished seems to become more difficult as the situation becomes a morass of details. The advanced beginner can easily start to feel overburdened by the complexity of the skill domain, even in what is eventually perceived as a totally routine situation.² At this stage and the next one, it is especially important for an instructor or mentor to help the learner cultivate an emotional disposition that will enable them to continue learning and not to succumb to the increasing frustration and sense of being overwhelmed (Flores, 2016; Dreyfus, Dreyfus, & Rouse, 2016).

Occasionally, a learner can enter a skill domain in a composite of stages 1 and 2, which is exemplified in freestyle tinkering. Some particularly talented learners may even be able to jump right into a domain performing as an advanced beginner, as with musicians who learn techniques and rules for playing only *after* they have already begun tinkering with their instrument and learning their way around by watching and mimicking others playing.³ Tinkering can enable the emergence of an initial familiarity in a skill domain, and it can be enacted either by a solitary learner or with pedagogical guidance. Thus, someone teaching him- or herself a new computer program such as Photoshop may begin by browsing certain sections of the instruction manual with its descriptions of program features and general rules for using them. However, the learner may quickly transition to tinkering in the program rather than bothering to read further through the instruction manual. By tinkering, they gain experience and a sense of what to expect, what it is possible to do, and what works and what doesn't work when they make certain commands or

² See the corroboration of this point in St. Pierre and Nyce (2020, p. 5) who studied the training of anesthesiologists using the Dreyfus skill model. They make this point about being overwhelmed by routine work in reference to a novice anesthesiologist, but the sense of being overwhelmed amplifies for the advanced beginner.

³ See, for example, Gary Marcus's (2012, pp. 148-150) discussion of musicians who learn how to play without learning formal rules.

apply certain functions in the program. When they hit a wall, they may decide to go back to the instruction manual or ask a friend for advice. The rules and advice will likely be more readily graspable by such a learner who has some experiential tinkering under their belt.

As mentioned above, in the kitchen, a cook might not be able to articulate their own know-how with respect to a certain recipe into precise procedures and measurements. In teaching someone else how to prepare the dish, they may begin by pointing out aspects and maxims along with features and rules. Hence, disjunctive directives involving both context-free rules and situation-specific aspects could be provided to an advanced beginner: “Sautee the ginger in oil until it is fragrant, then add 1 cup of lentils and 3 cups of water. Let the water and lentils mixture boil for 25 minutes or until the lentils start to breakdown like *this*.” The characteristics of “fragrant ginger” and lentils “breaking down like *this*” are situational aspects indicated by the instructor to the learner, in combination with the rules referring to context-free features such as the measurements of water and lentils. Additionally, through experience and tinkering, the learner can begin to notice situation-specific aspects and to formulate their own maxims, such as, “If the soup is sputtering, it is too thick. Add a little water.”

The phenomenon of tinkering shows that a learner can pivot between the stages of novice and advanced beginner. This points to a general observation, namely, the stage at which a learner performs is not rigidly determined, and may vacillate across stages depending on a variety of factors. This does not mean that a novice can simply jump to the third stage, competence, however. After the stages of novice and advanced beginner, learners who have advanced to a higher stage (competence, and beyond) might, depending on the novelty of their situation or their own efforts to experiment with novel techniques, sometimes perform in a manner characteristic of a lower stage.

Stage 3: Competence

With continued experience, the number of potentially relevant circumstantial elements and procedures that the learner is able to recognize and follow continues to increase. However, a sense of priority and relative importance of these various elements and procedures is lacking. Performance accordingly becomes more grueling. The next stage of learning, competence, is achieved when people learn to devise a plan or, in our preferred technical term, to choose a *perspective* on their situation. In choosing a plan or perspective, the performer orients toward achieving a particular goal. In relation to this goal, the various elements of the situation are assigned a differential relevance and the steps of the task are arranged in a provisional sequence. In other words, to relate to a situation from a chosen perspective is to relate to its elements not as an aggregation of features vying for attention, but in terms of a differential *saliency*.

A perspective can have a narrow or a broad scope. A narrow perspective governs what is relevant for a proximal goal on a short time horizon, for example, getting through the curve on this off ramp safely, as opposed, say, to getting through it in a way that shows off a driver's bravado or indifference to traffic laws. Normally, though not necessarily, these proximal perspectives fall under the scope of a broader perspective which brings to bear general, strategic considerations, such as the choice of a destination and a selection among the various possible routes for traveling there (some routes offering the possibility of efficiency and speed, others offering scenic beauty, for example).

When attending to only a selection of the vast expanse of possibly relevant features and aspects, the performer has a burgeoning sense of orientation, and situations of action become less overwhelming. Thus, to elaborate the example initiated above, a competent driver is able to relate to the task of driving by forming strategic goals such as choosing a particular destination

and choosing to arrive there *efficiently* as opposed, say, to getting there *comfortably* or by way of a scenic route. With this perspective, elements such as the number of lanes and traffic lights and the amount of traffic are salient in making the numerous specific, proximate driving decisions along the way (such as when to change lanes, when to exit the freeway, when to accelerate or decelerate, etc.). Meanwhile, scenic beauty, norms of driving courtesy, and the fact that the sunroof is open are all elements of the situation that, given the driver's chosen perspective, are currently irrelevant and able to be ignored. Of course, if it starts to rain, the fact that the sunroof is open will become relevant.

Competent cooks are able to prepare distinct dishes in parallel rather than by following different recipes in serial order, one step at a time. In doing so, they will choose a perspective to organize the tasks and the relevant features and aspects of the situation. For example, they can choose a perspective whereby both dishes are to be simultaneously ready after the guests arrive, or whereby the cold salad is to be ready before the hot pasta, or whereby the difficult recipe is to be prepared before the easy one. For each perspective, some sequence of tasks and some selection of elements of the situation will be foregrounded as relevant (e.g., deciding certain vegetables to chop first, deciding which pots and pans to select for use, etc.) and others will be irrelevant (e.g., the refrigerator as a tool for keeping the salad cold while preparing the pasta).⁴

Keeping with a continued reliance on rules and maxims for determining action in each situation, the competent performer seeks rules and reasoning procedures for choosing a perspective. In many situations, however, there will simply be no rules available for doing so.

⁴ Such considerations reveal that what Christensen, Sutton, and McIlwain (2016) call “situational” and “strategic” control start to be involved at the stage of competence. As we will see in the next stage, these authors are mistaken that these dimensions need to be subject to conscious, cognitive control rather than subsumed into skillful coping. What we call “reflexive reorientation” involves a non-deliberative, pre-reflective form of situation and strategic control.

When it comes down to it, often the choice of perspective rests on the performer's own determination of what is best or what is appropriate to do in a situation. Learners must decide for themselves in each situation what perspective to adopt, and whether to change the one they have already adopted in view of how the situation is unfolding, without having any guarantee that it will turn out to be the best or even a workable way of proceeding.

On account of this new dimension of uncertainty, the competent performer becomes involved in the situation with a heightened level of emotional intensity and with a growing sense of responsibility for outcomes (Dreyfus & Dreyfus, 1988). Whereas prior to this stage the learner could remain detached and explain away poor performance as due to a lack of adequate rules, now the quality and results of the performance depend on the performer's choice of perspective, not to mention the choices of particular actions that follow from the perspective. Through such heightened involvement, the competent performer begins to feel remorse or disappointment at poor performances and joy and elation at successful ones. By gaining experience with many kinds of situations approached in a variety of perspectives, the learner gains more and more familiarity with their domain. To advance to the next stage of learning, it is essential for the learner to continue gaining experience in choosing perspectives in a variety of situations, seeing which ones enable successful performances and which ones do not, savoring the joy of the successes and ruminating over the disappointment of the failures. The joy of a job well done makes it more likely that the perspective guiding the successful execution will occur to the performer the next time they encounter such a situation. For some, the joy of a job well done might also increase their motivation for continuing to gain experience and learn in the domain.

Leaving the freeway on an off-ramp curve, a competent driver may decide she is going too fast after explicitly taking into account the car's speed, the road's surface condition,

criticality of time, distance of the cars in front and behind, etc. She then chooses the perspective that this is a situation that requires slowing down. After doing so, the competent driver then still has to decide on the means of doing so, whether by letting up on the accelerator, removing her foot altogether, or stepping on the brake, and precisely when to perform any of these actions. She is relieved if she gets through the curve smoothly and unsettled if she has to suddenly swerve, or worse, smacks into the car in front of her (Dreyfus & Dreyfus 1988).

The competent cook who approaches the meal preparation under the perspective that the hot dish should be finished before the cold one will regret it if the hot dish grows cold and unappetizing to the guests when mealtime has finally arrived. Next time, the low-heat simmering burner will be more salient as a possible means for keeping the pasta warm, or the refrigerator will be salient as a means for keeping the salad cool while the pasta finishes cooking, or a different perspective will be tried, whereby the cold dish is to be prepared before the hot dish.

A competent chess player may decide after studying a position and weighing alternatives that her opponent has weakened his king's defenses. Given this, she adopts the goal to attack the opponent's king. In the course of the attack, the weaknesses in her own position that are created, as well as the loss of pieces that are not essential to the attack, are non-salient and recede to background, ignored, while pieces defending the enemy king stand out as salient. As with all competent performers, her emotional involvement continues to be heightened. "Successful attacks induce euphoria, while mistakes are felt in the pit of the stomach" (Dreyfus & Dreyfus, 2008, p.116).

Two further points pertain to the way in which, at the competent stage, the learner begins to be responsive to more dimensions of their situation. First, compared to the beginner and advanced beginner, the competent performer begins to pay more attention to the role that the

actions and involvement of other people — the movements of other drivers, the assessments and preferences of the dinner guests, the strategies of other players — play in the execution of the skill. Second, in choosing a plan or perspective on the situation, the performer shows a more robust anticipatory sense for how typical situations play out and unfold over time. The competent driver aiming to get somewhere fast will, for example, look ahead to traffic lights that might be about to turn yellow, and he will begin to be on the lookout for other, slower drivers whose maneuvers he expects will slow him down, as well as for pedestrians who look poised to step into the street, adjusting his present action (whether or not to further accelerate) in response to his sense of how the situation is about to unfold. Similarly, the competent nurse thinks about what is likely to happen in the future in order to plan present care (Benner et al., 1996). This is in contrast to both the beginner and advanced beginner who tend to be focused on implementing the skill from moment to moment in the present.

It is not uncommon for learners to become stuck at the competent stage and to display rigidity in the perspective they have chosen. This happens, for example, in failing to reorient to a new perspective or change their plan even when a different one would produce superior results and enable a more dexterous response to the contingencies of a given situation. Competence can often enable adequate performance in many domains and, despite the risks and heightened involvement that go with choosing a perspective, there is a sense of comfort in being able to rely on rules and procedures after the choice of perspective is made. This comfort is related to the fact that our rationalistic culture has endowed us with a common sense that valorizes detached rule-following and calculative rationality as the optimum modes of human behavior (Dreyfus & Dreyfus, 1988; Dreyfus 1992). However, to make the transition to proficiency and beyond, a performer needs to be motivated to take a new kind of risk: letting go of rules, procedures, and

decisions as they learn to trust their quickening intuition.

Stage 4: Proficiency

As the competent performer gains experience, she allows herself to become more and more emotionally involved in her task, reminiscing, sometimes with the continued support of a mentor, about the elation of a job well done and the stinging disappointment of failure. She is now poised to make another major qualitative leap in the acquisition of skill. Whereas the advanced beginner approaches situations in a stance of detached maxim-following and the competent performer retains a stance of detachment in deliberately choosing a perspective, with enough experience, the learner develops a capacity to group together typical situations whose elements now display a certain salience. This is to say, the mark of the stage of proficiency is that a perspective on the situation *intuitively occurs* to the learner, rather than having to be *chosen*. We call this the emergence of an *intuitive* perspective. When an intuitive perspective occurs to the learner, the elements in the situation spontaneously show up with a differential relevance, polarized with a certain foreground-background structure. Some elements stand out as relevant and important and some recede into to the background, able to be ignored. To adapt a term from James J. Gibson (1979, p.127), at the proficient stage, a learner begins intuitively to pick up on the “affordances” characteristic of typical situations in the domain. An affordance is a feature of an animal’s environment that stands out as providing (affording) possibilities for action, as when a tree affords escape from a pursuing predator, or a gap in traffic affords changing lanes. When the affordances of a situation stand out as intuitively obvious due to extensive prior experience, rather than being arrived at through deliberative calculation, there is less doubt as to whether one’s sense of the situation is appropriate. However, the proficient

performer will still need to decide what to do in response to this new direct sense of the situation's salient affordances.

To be able to perform at the stage of proficiency, the learner will have experienced a range of typical situations that arise in the skill domain and the perspectives that have worked and not worked for coping in them. The positive and negative emotional experiences that arise will encourage the recurrence of successful perspectives and inhibit unsuccessful ones. Over time, the theoretical knowledge of the first stages of skill acquisition, as represented by rules and procedures, will gradually be replaced by the direct, holistic situational discriminations of an intuitive perspective. Proficiency seems to develop if, and only if, experience is assimilated in such an involved, affectively laden, atheoretical way (Dreyfus & Dreyfus, 2008). When attaining to proficiency, it would be beneficial for a mentor to point out and celebrate the occasions when an intuitive perspective occurs to the performer in order to help lead the performer begin to trust his intuition rather than continue to rely on rules and procedures (Dreyfus, 2016). In the literature on skill acquisition, the ability to approach a situation in light of an intuitive perspective is sometimes referred to as the capacity for "making sense" of situations, or "sensemaking," in the domain (see, e.g., Weick, 1993, and Klein, 2009).

At this stage, the involved, experienced performer sees situations in the skill domain from an intuitive perspective, but, as mentioned, must still decide how to respond. This is no surprise since there are far fewer ways of seeing situations than there are ways of reacting. The proficient performer simply has not yet had enough experience with the outcomes of the wide variety of possible responses to have an intuitive sense for what works and what doesn't work. In deciding what to do in response to the situation that shows up in light of an intuitive perspective, the proficient performer will fall back on detached rule and maxim following. Accordingly,

“elements that present themselves as important, thanks to the performer’s experience, will be assessed and combined by rule to produce decisions about how best to manipulate the environment” (Dreyfus & Dreyfus, 1988, p. 29).

The proficient driver, heading into a curve on a rainy day, may feel in the seat of his pants that, at his current speed, he is approaching dangerously close to the driver ahead. That is, excessive speed is suddenly and intuitively presented as the most salient aspect of the situation. He must then *decide* based on other salient elements of the situation such as the color of the approaching traffic signal, the proximity and speed of the driver behind, and the wetness of the road, “whether to apply the brakes, remove his foot from the accelerator, or merely reduce pressure” (Dreyfus & Dreyfus, 1988, p. 29). Even though time is lost in such considerations, the proficient driver is more likely to get through the curve safely than is the competent driver. The latter spends additional time explicitly *considering* the proximity and speed of the driver ahead and *selecting* the other salient elements of the situation in the course of *deciding* whether or not he is dangerously close to the car ahead (Dreyfus & Dreyfus, 2008). The proficient cook can intuitively discern that a sauce is too thin and in need of a thickening agent; however, he has to decide whether or not arrowroot, cornstarch, gelatin, or xanthan gum is the appropriate option for this dish and for these dinner guests. The proficient chess player can intuitively discern almost immediately the salient forces in a meaningful chess position. Presented with an intuitively meaningful situation, she then deliberates about what to do. She may know that she should attack, for example, but she must calculate how best to do so.

The stage of proficiency is characterized by a refinement in the two abilities that we noted as emerging with competence, namely, the abilities to attune to and coordinate oneself with respect to the actions of other people involved in the situation and to detect and adjust if the

situation evolves in a way that diverges from the performer's perspective-induced anticipations of how things will unfold. These refinements continue to develop in the next stage, expertise.

Stage 5: Expertise

With more and more experience in a variety of situations, the performer builds up a vast repertoire of intuitive perspectives. She also becomes able to make more subtle and refined discriminations and anticipations within situations seen as similar with respect to a perspective. After enough experience of the results of actions in a particular type of situation, the performer not only experiences such situations in light of an intuitive perspective, but also sees immediately what to do and allows herself to be drawn directly into action. The expert performer closes the gap between intuitive perspective and action.

Given enough experience, one can, and generally does, naturally become an expert in everyday skills and in skills required for survival. Animals, through experiential learning, tend to become expert at the skills their survival demands (Schultz et al., 1997). Human beings, through experiential learning tied to socialization, tend to become experts in the skills for coping with the familiar situations that recur in their everyday lives, including everyday skills like walking down sidewalks, greeting friends and colleagues, ordering food in a crowded restaurant, etc. (Dreyfus, 1992). Becoming an expert in *specialized* or elite skills, however, requires some degree of talent and, importantly, strong motivation and emotional investment in the skill domain, in addition to vast experience.

As we have seen, at the stage of proficiency, the intuitive salience of a situation is not yet directly linked with ways of responding, and so deliberately deciding what to do in light of an intuitive perspective is still necessary. For the expert performer, in contrast, the intuitive salience of a typical situation is experienced as a direct solicitation to respond. The expert experiences

attractive and repulsive motivational forces that directly guide her action in the situation. That is, having had enough experience responding to situations in light of intuitive perspectives, the expert is directly drawn into action when an intuitive perspective clicks into place for her. Again, this direct, immediate response to an intuitive perspective often occurs without the expert being able to explain how or why she does what she does.⁵ This coupling of a perspective that intuitively clicks into place with a direct response is the qualitative distinctiveness of the expert's perception of the task environment and corresponding mode of action.

The expert driver not only feels in the seat of his pants that he is going too fast; his sense of going too fast draws him directly into an appropriate action without calculating and comparing alternatives. In response to his sense that he is going too fast, his foot straightaway lifts off the accelerator. The expert cook, presented with an array of ingredients and kitchen appliances, can see immediately a range of dishes that are possible to create with them, understand the order in which to approach the stages of preparation, and set directly to work prepping the initial ingredients and calibrating the relevant kitchen appliances. The chess Grandmaster has an intuitive sense of the best moves and can play at the rate of 5 to 10 seconds a move and sometimes faster without noticeable degradation in performance. At such speed, intuition is leading the way rather than analysis or comparison of alternatives. It has been estimated that an expert chess player can distinguish roughly 100,000 types of positions. Experts in other domains must be capable of drawing upon a comparatively large number of intuitive perspectives with linked actions (Dreyfus & Dreyfus, 1988, 2008).

An expert nurse, familiar with a particular patient's patterns of response, will be able to discern that the patient is in imminent danger of cardiac arrest by detecting changes in "his

⁵ For a detailed elaboration of this point, see Dreyfus (2004).

colors, his eyes, if he tremored” before overt changes in the vital signs are registered on the monitors, and she will know intuitively what to do in order to prevent arrest from happening, e.g., adjusting intravenous medications and ventilator settings (Benner et al., 1996, p. 145). Nurses need always to be attending to transitions in the patient’s condition, and expert nurses have a refined sensibility for whether or not the developments of the patient’s condition are in keeping with her perspective-induced anticipations of how the patient will respond to treatment (Benner et al., 1996). Thus, an expert nurse will intuitively know if, or when, to reassess the patient’s situation during transitions in the patient’s condition during intensive care. If new clinical evidence stands out as salient and a new perspective suggests itself, then expert nurses will be ready to allow their intuitive perspective on the patient’s condition to be reoriented, and will know what to do in response. Adapting a term from discussions in recent neuroscience, we call this intuitive, non-deliberative shifting of perspective “reflexive reorientation” (Levy & Wagner, 2011; Dreyfus, 2014).

Such readiness for reflexive reorientation is an important feature of expertise in general. Actions unfold over time and the nature of the situation in which a skillful action is solicited may change or may turn out surprisingly not to be as the performer initially anticipated. Therefore, any expert may need to accept reconfigurations to the perspective in light of which they are drawn to cope in their situation. Provided the repertoire of intuitive perspectives that the expert has built up through experience, such a shift in perspective need not be the outcome of a calculative deliberation or choice. Rather, shifts in perspective can be directly elicited by the changes in the situation. Through vast experience, experts can directly detect under what circumstances during a sequence of actions to accept and respond to the situation in light of a changed perspective. Things click into place in a new way, like a gestalt switch, and they act.

Many non-human animals, incapable of deliberation, learn not only how to intercept a running prey, but also when to switch to the perspective required for blocking an escape route in circumstances when that is a better strategy. The animal does not deliberate and decide to change its goal; it merely responds, on the basis of past experience, to new salencies in the developing situation, for example, a tree that the prey might climb (Dreyfus & Dreyfus, 2008). It should come as no surprise that people are capable of learning to do the same kind of deliberation-free reorientation in which their situational goal and perspective are changed. If a fly ball is hit in the general direction of an expert baseball outfielder, an intuitive perspective that, for example, this is a ball to-be-caught will intuitively occur to him. As such, the outfielder will “see as salient the angle of ascent of the ball, perhaps the location of nearby fielders, and maybe the location of the sun if he has learned to take account of this so as to move in a way that avoids looking directly at it” (Dreyfus & Dreyfus, 2008, p. 119). Occasionally, if the ball has been hit more strongly than anticipated, the situation may transition into one where the fielder will not be able to catch the ball. If the fielder is experientially skilled with this kind of situation, when this happens, his perspective will switch over into a different previously learned one that is available in his vast repertoire. Once the new perspective clicks into place, previously irrelevant elements such as the location of the outfield wall, whether there are runners on base, and the known running speed of the batter become salient, and the fielder’s solicited actions will change to ones now appropriate. Similarly, an expert cook, upon learning of the dietary restrictions of his dinner guest, can seamlessly switch perspectives whereby vegan or gluten-free substitution ingredients now become relevant as he transitions into the related preparation methods.

The first five stages of this skill model are summarized in Table 1 below:

Table 1: Five Stages of Skill Acquisition

Skill Level	Components	Perspective	Action	Commitment
1. Novice	Context-free	None	Analytic	Detached
2. Advanced beginner	Context-free and situational	None	Analytic	Detached
3. Competent	Context-free and situational	Chosen	Analytic	Detached choice of saliences and of action; involved in outcome
4. Proficient	Situational and context-free	Experienced	Analytic	Involved experience of saliences; detached choice of action
5. Expert	Situational and context-free	Experienced	Intuitive	Involved

Performing Across the Stages

Experts in many domains, but most notably in sports, occasionally experience periods of peak performance, also variously called “flow,” “in the zone,” and playing “out of one’s head” (Dreyfus & Dreyfus, 1988, p. 40). In these periods, “everything becomes easier, confidence rises, time passes without awareness, and the mind, which usually to some extent monitors performance and how the situation is unfolding over time, is quieted while performance is at its peak” (Dreyfus & Dreyfus, 2008, p. 120). We presume that during such periods, when the situation evolves in line with the performer’s intuitive anticipations, the direct learning from experience that normally accompanies all performance, even expert performance, temporarily

ceases (though learning through retrospective consideration of the performance is still possible and likely). Such flow is a transient state that cannot be willfully chosen; it emerges when the unfolding situation meshes with the expert's finely tuned capacities and readiness for responding to what might occur. While both experts and masters (discussed below) can occasionally experience such total mindlessness, we do not count it as a separate acquirable stage of skill. Rather, we see it as a maximally focused manifestation of expertise.

While the expert is capable of deliberation-free action solicited through an intuitive perspective, situations are bound to arise in which experts do engage in deliberation. Becoming an expert does not mean that the performer will only perform at the expert level from then on. This point would count under the heading of “needless to say,” but a number of critics of this skill model over recent years (e.g., Gobet, 2018; Høffding, 2018; Montero, 2016), drawing narrowly and selectively on the published record, have purveyed a caricatured version of it that overlooks the fact that our main claim about expertise is a conditional (Dreyfus & Rouse, 2018). The key claim is the following: “*When* things are proceeding normally, experts don’t solve problems and don’t make decisions; they do what normally works (Dreyfus & Dreyfus, 1988, pp. 30-31, italics modified).

What about when things are *not* proceeding normally? That is, what if the situation of performance is sufficiently and unexpectedly novel and without the scope of the performer’s repertoire of intuitive perspectives? An expert’s level of performance may vacillate across the five stages over the course of a performance, depending on a variety of factors. There are many contingencies that shape whether a situation encountered is novel and, thus, elicits deliberation. In sufficiently novel situations, the expert is drawn to engage in a form of deliberation characteristic of the lower stages of performance as a surrogate for intuitive understanding.

Beyond this, in situations sufficiently familiar to elicit an intuitive perspective, some experts, when stakes are high and time allows, will be open to engaging in a kind of deliberation aimed at improving upon the intuitive perspective that has occurred to them in an episode of what we call “perspectival deliberation.”

Deliberation in Novel Situations

A variety of scenarios may emerge in which experts find themselves engaging in forms of calculative deliberation characteristic of lower stages of performance. Again, the defining characteristic of this calculative deliberation is that it is not guided by a perspective, or a holistic sense of the situation (what kind of situation it is, what its affordances are, and what are the ways of coping that normally work) in terms of which various elements stand out as important, relevant, or possibly relevant, or recede into the background as irrelevant. Without a perspective, the situation of performance is experienced as a more or less complicated collection of facts and features demanding of attention and reflection. Performers will engage in calculative deliberation when, as beginners and advanced beginners, they have not yet had enough experience in the skill domain and need to rely on the explicit, calculative application of general rules and situational maxims to context-free features or situational aspects, or when as competent performers, they need to decide which perspective to adopt. When *experts* are drawn to engage in calculative deliberation, it is either because they have encountered a situation so novel that no perspective occurs to them, or because they initially intuitively relate to and act in the situation in light of a perspective that gets undermined by how the situation evolves over time.

Even for experts, novel situations may still be encountered (in some skill domains more than others). Given the indefinite expanse of concrete contingencies that can arise as life and situations unfold or, in the case of structured activities like chess or Go, given the immense

number of possible board positions, few situations of performance will be *exactly* the kind for which past experience intuitively dictates what move is to be made (Dreyfus & Dreyfus, 1988). This claim is not an inconsistency in this skill model as Christensen, Sutton, and McIlwain (2016) make it out to be. Rather, it is a feature of the model's capacity for explaining the gamut of skilled action. If the situation is sufficiently novel or atypical and no intuitive perspective is available or obvious, or if more than one intuitive perspective suggests itself, the expert may fall back on deliberating about which perspective to adopt or paying attention to situational aspects which call for the application of situational maxims.

Situations may be novel to the expert performer because their experience has been limited in some ways. For example, consider a musician who is capable of expert performance in small clubs or bars, but who has had limited experience playing before an audience in a large venue where one listens to one's own performance through stage monitors and is the focal point of a potentially disorienting light show designed for stimulating the audience. This musician will have to learn and act on new maxims such as, "If you hear that high-pitched feedback when you get near your amplifier, lower its stage volume, or step farther away from it." The same holds for everyday skills like walking in a park (Dreyfus, 2014). If a pedestrian strolling through an unfamiliar park repeatedly almost trips over tree roots jutting across the path, he would do well to adopt for himself a maxim such as, "When you notice a tree root protruding, lift your foot a little higher." Abiding by this maxim can enhance his skill in walking the park's novel paths. In general, for most skill domains, except the most austere structured domains, there will be, as Sutton and Bicknell (2021) point out, "variations in the settings and contexts of practice and performance" (p. 197) that may make for a sufficiently novel situation even for an expert with vast experience:

Professional athletes regularly navigate factors as various as changing weather conditions, unfamiliar locations or terrain, equipment and new technologies, fatigue, injury, pain, risk, the sounds and expectations of crowds and supporters as well as media, self-imposed or career-threatening pressure, interaction with peers or team-mates under varying constraints, the actions of opponents and other competitors, and strong personal emotions. (Sutton & Bicknell, 2021, p. 197)

Next, experts with vast experience can encounter novel situations because of changes in the domain over time. Examples include changes in relevant technologies, as with transitions in the materials out of which the tennis racket is made and the increase in its head size, which altered the dynamics of play. Additionally, novel situations can emerge due to changes in the rules of the skill domain, as when the three-point shot or the slam dunk were declared a possibility in the constitutive rules of basketball. Computer programs often update their software, thereby changing the range of possible actions in the program so that experts in one generation of program will encounter novel situations in the forthcoming updates.

In addition to changes in technology and constitutive rules that govern the skill domain, variations in local regulative rules can also lead an expert to encounter novel situations where they need to deliberate and choose.⁶ Take for example, countries in which the laws for the direction of the flow of traffic is reversed, such as England or Japan compared to the United States and continental Europe. Drivers and pedestrians who are capable of expert performance in their home country will need to constantly remind themselves (or pay attention to the reminders printed on the sidewalk edges) that their intuitive responses may lead them to turn dangerously into the direction of oncoming traffic.

⁶ On this distinction between constitutive and regulative rules, see Searle (1995).

Expertise in everyday skills such as sitting on public transportation or walking down a city sidewalk is also susceptible to degrade in the face of variations and changes in local norms of behavior. Men who unthinkingly sit in public transportation in a way consistent with certain forms of masculine socialization such that they take up a lot of space, spreading their legs far apart and stretching out their arms into neighboring seats, are now sometimes shamed for “manspreading.” Those who are sensitive to this critique will now tend to think twice and make deliberate decisions about where they sit and how they position their limbs so that they will not be in violation of the intensified norms governing the respectful sharing of public space. People familiar with navigating crowded city streets will know how to vary the angle of their body and speed of their gait to avoid colliding with oncoming pedestrians. However, people from less populated areas, who are more protective of their personal space and not accustomed to other pedestrians walking straight towards them on the sidewalk may stop in their tracks or even brace themselves for collision. With enough experience, they can then realize that they need to pay attention to the distance and angle of the oncoming pedestrians and formulate a rule of thumb such that they turn the angle of their shoulders 45 degrees when they are about one arm’s length away.

Perspectival Deliberation

The above kinds of deliberation transpire when an expert encounters a sufficiently novel situation, one where no intuitive perspective occurs to him or where the intuitive perspectives that do occur turn out not to fit the situation as it unfolds. This calculative deliberation in general tends to be an interruption in and degradation of expert performance, even if a temporary one that can serve the emergence of a new intuitive perspective. There is another kind of deliberation in action that can transpire in the service of expert performance. Dreyfus and Dreyfus (1988)

refer to this as “deliberative rationality” (p. 36), though we now offer “perspectival deliberation” as a more fitting label. In calculative deliberation, the performer, lacking an intuitive perspective on the situation, reverts to general rules or situational maxims for guidance on how to proceed. In perspectival deliberation, the expert performer already perceives the situation in light of an intuitive perspective that occurs to her on the basis of past experience. So, perspectival deliberation is not in search of a rule or a maxim for how to proceed. Rather, here the deliberation involves testing limits, imagining alternatives, or seeking to improve the intuitive perspective that has occurred to the performer. We will briefly run through two types of perspectival deliberation, with the proviso that they are not offered as an exhaustive taxonomy.

For the expert, most typical situations in the domain can be responded to immediately and intuitively. But, again, contingent variations are bound to be encountered. If the difference between the present situation and ones experienced in the past is sufficiently pronounced, then the present situation will be experienced as novel. No perspective that makes sense of the situation will intuitively occur to the expert, and she will relate to it in the ways we described just above, either by deliberately choosing a perspective, and/or by falling back on the application of rules and maxims. Perspectival deliberation can take place when contingent variations in the situation do not prevent an intuitive perspective from occurring to the expert. Indeed, more than one intuitive perspective may occur to a performer in some situations.

A first kind of perspectival deliberation happens when performers need to choose between two or more intuitive perspectives. To do so, they may extrapolate ahead, reflectively entertaining their expectations of the situations (for example, chess positions) that would ensue from the actions entailed by each perspective. They then evaluate the expected circumstance by taking into account confidence, risk, urgency, etc. During deliberative extrapolation of this kind,

if time allows, performers might also seek advice or help from a coach, a mentor, or someone else with more experience than they have had. In these ways, performers put detached deliberation in the service of intuition.

A second kind of perspectival deliberation can happen when an intuitive perspective occurs to the performer and contingent variations – e.g., “changing weather conditions, unfamiliar locations or terrain, equipment and new technologies, fatigue, injury, pain, risk, the sounds and expectations of crowds and supporters” (Sutton & Bicknell, 2021, p. 197) – may remain marginal or recessed in the background, while at the same time being registered in a sense of tension or uneasiness. The tension comes from the expert’s past experience with situations in which what initially seemed like marginal variations become relevant or important in a new perspective. Sometimes, the sense of tension will enable the performer to automatically switch over into another available perspective wherein the currently nonsalient contingent variations become salient, in a case of reflexive reorientation. In other scenarios, the performer has an opportunity to hold on to this tension and to reflect on the seemingly marginal variations giving rise to it.⁷ The sense of tension can hold the key to a new perspective, including a shift in overall strategy, that would better guide or open up new possibilities for action. In order to bring about a switch in perspective, the performer can focus on the contingent variations that are marginal from his current perspective. By doing this, it is possible that an alternative perspective will occur to him, in a regestaling of the situation, whereby the nonsalient becomes salient. An example from chess of this sort of perspectival deliberation is when the player focuses on aspects of the situation that seem irrelevant or unimportant when seen from one perspective, it is possible for another perspective in which those same elements are central to occur to the player. This

⁷ For a wider discussion of the capacity to attune to tensions or disharmonies in one’s sense of a situation, see the discussion of “anomalies” in Spinoza, Flores, & Dreyfus (1997).

deliberately revealed perspective may even be that of one's opponent. In this way, one protects oneself from blunders produced by failing to anticipate the opponent's move (Dreyfus & Dreyfus, 1988).⁸

Another dramatic example of this perspectival deliberation can plausibly be found in a famous and tragic disaster in the history of firefighting, the Mann Gulch Fire in Montana in August of 1949.⁹ A team of smokejumpers (airborne, wildland firefighters) were deployed to the Mann Gulch area to deal with a fire thought to have been ignited by a lightning storm. Compressing myriad details, what initially looked like a small, manageable fire was suddenly roaring towards the smokejumpers, a mere 200 yards away and closing, with 30-foot-high flames. The foreman, Wagner ("Wag") Dodge, perceived the situation in light of a perspective that dictated the crew to turn around and head towards the ridge of the hill, away from the fire and where the fuel is thinner, and he gave the order. On the way up the hill, the situation evolved to one in which the crew was moving through tall grass (two and a half feet tall), with the fire continuing to gain on them. From the perspective of aiming to get up the hill as fast as possible, the tall grass was a marginal feature of the escape route to be pushed through as quickly as possible, but still presumably registered for Wag, sensed in a vague tension, as possibly relevant.

However, in the midst of this tall grass, with the conflagration gaining ground on them, Wag unexpectedly told the crew to drop their tools. To the bafflement of everyone, he started a fire in the grass around them, their only escape route, and ordered everyone to lay down in the area that it burned. Wag's new way of making sense of what the situation called for was

⁸ This perspectival deliberation is also a way to avoid tunnel vision, a way of becoming entrenched in one perspective due to a "failure to recognize a potential new perspective that better explains recent past events and better dictates future actions" (see Dreyfus & Dreyfus, 1988, p. 37).

⁹ Our treatment draws from Weick (1993), who draws from the account in Maclean (1992).

unintelligible in the moment to the others on his team. Only Wag himself took the actions that his new perspective dictated. The others did not hear his directive as a legitimate order, but as evidence that Wag had cracked under pressure and “gone nuts” (Maclean, 1992, p. 75). While Wag himself was able to survive by lying down in the ashes where the heat was less intense, everyone in his crew except for two others – a total of thirteen people – perished.

We propose that Wag, seeing the newly salient velocity and direction of the approaching fires and noting the distance of the top of the hill, lost confidence in the initial perspective that was guiding them to ascend to the ridge in order to escape the fire. Again, from that initial perspective, the tall grass itself was but a marginal feature of the situation, though still vaguely taken note of by Wag as possibly relevant. The urgency of the situation led Wag to focus anew on this tall grass. Because of his vast experience working with the forest service fighting fires and his background knowledge about how fires behave, attending to the grass enabled a new perspective to occur to Wag. In light of the new perspective, the grass became salient as affording the possibility of what is sometimes called an escape fire. Such a new gestalt on the situation can be seen as resulting from what we are calling perspectival deliberation, a mode of deliberation in which one seeks to improve upon the perspective guiding one’s action.

When experts display the kind of flexibility in their performance manifest in the above examples of perspectival deliberation, they continue to learn and to expand the range of intuitive perspectives that might be available to them in the future. These experts are already on the way to the next stage, mastery.

Stage 6: Mastery

The foregoing discussion has helped to clarify the antecedent clause of our claim that, when things are proceeding normally, experts don’t think and they don’t solve problems, they do

what normally works. Masters, however, are motivated and able to go beyond what normally works and makes sense as expert performance. Like Wag in the example above, masters are capable of advancing the boundaries of what counts as sensible or excellent in their domain and, in the process, they sometimes produce lasting transformations of how things are done and performances are evaluated.¹⁰ Master performers, then, unsatisfied with expertise, are strongly moved to look for opportunities to excel that are not noticed by satisfied experts. An emerging master is willing to accept the risk both of failure and of temporarily degraded performance while further expanding and refining their skill.

How does the developing master find opportunities for improvement that the satisfied expert does not see? We have seen how an expert in some situations senses a tension that guides him to withhold from following through with the action normally solicited by their intuitive perspective. The expert does this so as to see if a different perspective might intuitively occur to him and make better sense of the situation. It appears that the future master must be willing and able in certain situations similarly to withhold from acting in light of the perspective that intuitively occurs to him as an expert performer. Rather than suspending himself in receptivity for a new perspective that might occur to him, a master learner actively and experimentally chooses a different perspective. The new perspective lacks an accompanying action, so that too must be chosen, as it was when the performer was only proficient. This kind of experimentation “risks regression in performance and is generally done during rehearsal or practice sessions” (Dreyfus & Dreyfus, 2008, p. 121). For example, a masterful professional basketball player known for his exceptional ability to shoot three-pointers will have undoubtedly done this

¹⁰ In what follows, we emphasize the domain-transforming dimension of mastery. A more detailed treatment of the mastery of an individual performer is presented in Dreyfus & Dreyfus (2008).

countless times during practice when honing this skill. He will be dedicated to his chosen sport and will have savored successes during practice and played them over in his mind after the session.

In addition, master performers will be looking to marginal developments in the domain as they emerge, including changes in technology, in rules, and so on. For example, the advent of deep foam matting being used as a landing surface in the high jump may have been a marginal feature for many athletes and coaches. For Dick Fosbury, however, the deep foam landing surface afforded a new way of jumping that did not require landing with exquisite caution or on one's feet. In the Fosbury Flop, brought to the world's attention by Fosbury's gold medal performance in the 1968 summer Olympics, the athlete lands on the mat with their shoulders and back. Fosbury's way hurling himself over the bar was dramatically divergent from the dominant ways of high jumping at the time, but the efficacy of his new perspective permanently changed the style of the sport. When such withholding from conventional expertise yields improved performance or an unexpected breakthrough like the Fosbury Flop, the resulting emotionally rewarding experience reinforces the likelihood that, when in a similar situation in the future, the newly established perspective and action will recur without conscious effort, and what might be called "enhanced expertise" results.

A similar, masterful expansion of the repertoire of perspectives available in a domain, and ensuing stylistic change, can be seen in the pathbreaking musicianship of B. B. King, with respect to playing electric guitar, or Billy Cobham, with respect to playing a drum set with two bass drums. B. B. King was one of the first guitar players to approach playing the electric guitar through a perspective that made central its capacity, distinctive compared to the acoustic guitar, to sustain notes over time enabling King to make the guitar "sing" during solos. Before Billy

Cobham, drummers in jazz and rock had already been experimenting by playing on drum sets modified to include two bass drums, one for each foot. Many drummers would use the second bass drum as a marginal element in passing flourishes or in rhythmic patterns that could be executed with just one kick drum. Cobham was one of the first drummers to approach the composition of rhythmic patterns on a double bass drum set in light of a perspective in which the distinctive interplay between the two kick drums became the central feature (rather than a marginal element that appears in a passing flourish). What is now known as the “Cobham double bass shuffle” has become a style of drumming echoed and emulated throughout the domain of rock, heavy metal, and jazz music.

In sum, even though experts immersed in typical situations are capable of deliberation-free, intuitive action, they are bound to encounter situations that are atypical or sufficiently novel to upset that action. When they do, they will be drawn to engage in some form of deliberation, either calculative or perspectival, even though this may amount to a regression in their current performance. By doing so, experts gain new experience; they open themselves to continued learning and to expanding the range of perspectives available to them for future intuitive action in their domain. Strongly motivated experts on this trajectory will become masters who seek out occasions to expand their repertoire of intuitive perspectives and to test and expand the current limits of conventional expertise. In this way, some masters permanently alter the style of performance in their domain. The phenomenon of mastery reveals how human performers, when they transcend the application of theoretical knowledge and general rules, are capable not only of attaining intuitive expertise in their domain but of disclosing new possibilities as well.

Acknowledgements

We would like to thank Elaine Silva Mangiante and Kathy Peno and for their valuable guidance

on earlier drafts of this chapter and for their work in putting together this volume. Fernando Flores and Charles Spinosa each provided illuminating comments that helped us refine and improve our work. Additionally, we benefitted from conversations with Fern Alberts, A. Maria and Greg Wilkinson in developing some of the examples.

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