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## 2 Rationality, body, and intuition in human learning

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Our task is to broaden our reasoning to make it capable of grasping what, in ourselves and others, precedes and exceeds reason.

*Maurice Merleau-Ponty*

Context is central to understanding what social science is and can be. This chapter asks, "What role does context play in human knowledge and skills?" Philosophy of science and epistemology typically pose questions such as: "What is knowledge?"; "What can we know?"; "Under what conditions can we know that we know?" Here we will approach the question of knowledge by asking the more dynamic question: "How do people acquire knowledge and skills?" It is by addressing this question that we begin to understand the problem of context.

The intention here is not to outline and analyze all possible ways in which people acquire knowledge and skills, nor shall we review the many schools and theories that exist in this area. Rather we will deal with a single phenomenology of human learning as formulated by Hubert and Stuart Dreyfus.<sup>1</sup> This particular phenomenology has been chosen because it is especially useful for understanding the linkage between knowledge and context, and because it directly addresses the question of whether knowledge about human activity can be context-independent. The answer to this latter question is decisive for an understanding and response to two fundamental epistemological questions in the study of human activity: "Are theory and epistemology possible in social science?" "Can social and political science be scientific in the same sense as is natural science?"

The first part of the chapter reviews the phenomenology of human learning, the so-called Dreyfus model. We will then discuss the model's implications for social science.

### Competence and virtuosity in human learning

Some years ago in the United States, an experiment was conducted on a group of paramedics. Video films were made of six persons administering cardiopulmonary resuscitation (CPR) to victims of acute heart failure. Five of the six were inexperienced trainees just learning CPR, while the sixth was a paramedic with long experience in emergency life-saving techniques. The films were shown to three groups of subjects: paramedics with practical experience, students being trained in this field, and instructors in life-saving techniques. Each subject was asked the following question: "Who of the six persons shown in the films would you choose to resuscitate you if you were the victim of such an accident?" Among the group of experienced paramedics, 90 percent chose the one experienced paramedic from the films. The students chose "correctly" in only 50 percent of the cases. Finally, and perhaps surprisingly, the instructors in resuscitation had poorer results than either the experienced paramedics or the students, choosing the experienced paramedic in only 30 percent of the cases.<sup>2</sup>

What form of rationality led the instructors to achieve such a poor performance? And what mechanisms lay behind the experienced paramedics' well-developed ability to choose correctly? These questions will be dealt with in the following discussion.

Detailed phenomenological studies of human learning indicate that people pass through several phases or levels in the learning of skills, where "skills" are understood to range from the technical to the intellectual; e.g., building a house, being socially adept, analyzing a text. Various studies, all after the degree of detail, have divided the learning process into a varying number of such levels. The Dreyfus model operates with five levels in the human-learning process:

- (1) Novice
- (2) Advanced beginner
- (3) Competent performer
- (4) Proficient performer
- (5) Expert

They are levels, say Dreyfus and Dreyfus, because in phenomenological terms they consist of recognizable, qualitatively different ways of acting and performing in the process of learning a given skill. Individuals at a given level do better than individuals at the previous level. Not all people achieve the highest level in a given field. Some fields, such as chess, guitar playing, or surgery, are characterized by only a small fraction of novices becoming experts. In other areas, such as bicycling and driving, a large

number of novices reach the expert level. Let us examine the levels one at a time.

### *1. Novice*

As a novice, the individual experiences a given problem and a given situation in a given task area for the first time. During instruction the novice learns what various objective facts and characteristics of the situation are relevant for the performance of the skill. The novice learns to recognize these facts and characteristics when they appear. On this basis, the novice also learns rules for action. Facts, characteristics, and rules are defined so clearly and objectively for the novice that they can be recognized without reference to the concrete situation in which they occur. On the contrary, the rules can be generalized to all similar situations, which the novice might conceivably confront. At the novice level, facts, characteristics, and rules are not dependent on context: they are context-independent.

Let us take, for example, someone learning to drive a car. The student driver learns facts about speed and shifting gears, and he or she learns the rule that when the speed exceeds a certain level, you must shift gears. Both the fact (speed) and the rule (gear shift at certain speed) are independent of the concrete situation. In principle, shifting gears is executed as the same type of logical information process as within a digital computer. Later on, when the novice has shifted gears many times and has achieved a higher level in the learning process, the gear shift situation is recalled as analogous to prior situations. Shifting gears now occurs by reflex, without direct use of context-independent facts and rules.

Novices judge their skills by evaluating how well they follow the rules they have learned. When novices have learned a handful of rules for a given skill, however, performing the skill becomes so complex and demands so much concentration that it impedes continued improvement of performance. For example, the ability to speak and to listen to advice declines in relation to the number of rules which the novice learns and must remember to use. The first rules are necessary for gaining initial experiences, but the rules quickly become a barrier to the learning process and must be put aside in order for the novice to advance.

### *2. Advanced beginner*

The beginner advances from the first level in the learning process by achieving real-life experience, in contrast to the often deliberative and protected learning situations of the first level. Via these further experien-

ces, the advanced beginner learns to recognize relevant elements in relevant situations. Recognition occurs because the advanced beginner sees similarities in relation to prior examples of the same situation. Gaining experience consists in a cumulative recognition of similarities. Recognition is concrete and dependent on context, and it is precisely context which plays the decisive role, for it is context which becomes increasingly more important as one proceeds up the levels of the learning process.

For the advanced beginner, the basis for action may contain elements which are both situational and context-independent. A driver at the advanced-beginner level can thus shift gears on the basis of both the concrete situation of the motor sounds and the context-independent rule of speed, and will in fact use both indicators according to the specific situation. In this sense, situational behavior involves knowing when to bend or ignore the rules. A good chess player recognizes especially strong or especially weak positions in a concrete situation without use of context-independent rules. And there is no one who needs to combine facts and rules to identify the smell of freshly brewed coffee, Dreyfus and Dreyfus say. Personal experience via trial-and-error is more important than context-independent, explicit, verbally formulated facts and rules.

### 3. *Competent performer*

With more experience, the number of recognizable elements, which an individual sees in a concrete situation, becomes overwhelming. The individual lacks a feeling of what elements are important. In other words, the individual is unable to prioritize. At this stage, individuals learn from themselves and from others to apply a hierarchical, prioritizing procedure for decision-making. By first choosing a goal and a plan with which to organize the information about the concrete situation, and then processing only those factors relevant to achieving the goal and plan, the individual can simplify his or her task and obtain improved results.

A professor of nursing explains the problems her interns had with making the transition from the initial, rule-based levels in the learning process to the kind of prioritizing behavior and overview which characterizes competence:

I give instructions to the new graduate, very detailed and explicit instructions: when you come in and first see the baby, you take the baby's vital signs and make the physical examination, and you check the I.V. sites, and the ventilator and make sure that it works, and you check the monitors and alarms. When I would say this to them, they would do exactly what I told them to do, no matter what else was going on . . . They couldn't choose one to leave out. They couldn't choose which one was the most important . . . They couldn't do for one baby the things

that were most important, and leave the things that weren't as important until later on . . . If I said, you have to do these eight things . . . they did those things, and they didn't care if their other kid was screaming its head off. When they did realize, they would be like a mule between two piles of hay.<sup>3</sup>

Via goals, plans, and the setting of priorities, the student nurses learn to deal with a smaller set of key factors instead of the total knowledge about the actual situation. The competent nurse, in contrast to the beginner, does not go automatically from patient to patient in a preset sequence, but continually evaluates the patients' need for attention and care and arranges his or her routine according to these evaluations. The performer's behavior "flows" and becomes better adapted to the concrete situation.

Selecting a plan is not simple, and not without problems for competent performers. It takes time and requires deliberation. There are no objective procedures for choosing a plan similar to the novice's context-independent choice of facts and application of rules. Besides, the choice of plan has wide-ranging consequences for actions and results in a way which the choice of other elements seldom has. The lack of *terra firma* for the choice of plan, combined with the competent performer's need to have a plan, produces a new, important relationship between performer and surroundings: a relationship of involvement. The novice and the advanced beginner have only limited responsibility for the consequences of their actions, these actions being predetermined by learned elements and fixed learned rules. Excluding a gross error, a bad result will therefore appear as having been caused by inadequately specified elements and rules. Actions and results will thus stand in an external relation to the beginner: they can be justified and given a rational explanation in relation to objective facts and abstract rules. Competent performers, on the other hand, are personally involved in their actions. The competent performer, after having struggled with the problem of selecting a plan, feels responsible for the consequences of the choice precisely because selecting a plan cannot be done objectively, but must nevertheless be carried out in order to be able to act competently. Hence, the actions of the competent performer comprise an element of interpretation and judgment. As we shall see, the ability to make these judgments becomes crucial at the upper levels of the learning process. It is this ability, according to Dreyfus and Dreyfus, which constitutes the core of true human expertise.

Cognitivists and others who conceive of thinking as logical information-processing and analytical problem-solving concern themselves mainly with the kind of thinking processes which take place at the "competent performer" stage. Herbert Simon is a leading exponent of this view. In his attempt to understand how people select plans, goals, and

strategies, Simon and his colleagues have convincingly illustrated how people confronted with unknown tasks in unfamiliar situations act as analytical problem-solvers. The cognitivists, however, tend to generalize these results as being valid for all intelligent behavior. People are generally seen as problem-solving beings who follow a sequential model of reasoning consisting of "elements-rules-goals-plans-decisions."<sup>4</sup> It is this model which the cognitivists have attempted to simulate in computers and in various problem-solving models, in "expert systems" and in artificial intelligence. Their extrapolation yields good results when the models are applied to well-defined tasks with well-defined solutions. The cognitivists have had much less success, however, when the tasks and solutions are less well-defined. According to Dreyfus and Dreyfus, the poor results reflect the lack of evidence for the cognitivists' assertion that humans can act intelligently only by acting as analytical problem-solvers. There are other kinds of intelligent behavior, assert Dreyfus and Dreyfus, which appear especially among those individuals who are either very proficient or experts in their fields.<sup>5</sup>

In many of our daily activities, we can see phenomenologically that humans do not exclusively act as conscious problem-solvers, i.e., choosing goals, plans, and combining elements according to rules for reaching goals. When we ride a bicycle, recognize faces on the street, or talk to our neighbors, we do not appear to be solving problems. Of course, we may be operating unconsciously as logical information-processors and problem-solvers, but as we will see, this does not have to be the case and there is no evidence to support this claim. The fundamental error of the cognitivists is that they exclude any other possibility.

In contrast to the competent performer, genuine human experts exhibit thinking and behavior that is rapid, intuitive, holistic, interpretive, and visual and which has no immediate similarity to the slow, analytical reasoning which characterizes rational problem-solving and the first three levels of the learning process. On the contrary, it seems that there is a fundamental and qualitative jump from analytical problem-solving to genuine, human expertise. This jump must be made in order for someone to be really adept at performing a given skill. Stuart Dreyfus, the main architect behind the five-level model for human learning, is a competent chess player. However, he has remained at the "competent" level and cannot improve because he finds himself unable to make the qualitative jump to the next level of "proficiency," and he says he will never become an "expert." Dreyfus elaborates on the possible causes:

I was always good at mathematics and took up chess as an outlet for that analytic talent. At college, where I captained the chess team, my players were mostly mathematicians and mostly, like me, at the competent level. At this point, a few of

my teammates who were not mathematicians began to play fast chess at the rate of five or ten minutes a game, and also eagerly to play over the great games of the grandmasters. I resisted. Fast chess was no fun for me, because it didn't give me time to figure out what to do. I found grandmaster games inscrutable, and since the record of the game seldom if ever gave rules and principles explaining themselves, I felt there was nothing I could learn from the games. Some of my teammates who through fast chess and game studying acquired a great deal of concrete experience have gone on to become masters.

As I look around at my mathematical academic colleagues, most of whom play chess and none of whom have gotten beyond my own competent level, I see how our view of chess as a strictly analytic game has cut us off from absorbing concrete chess experience. While students of mathematics and related topics predominate in the population of young people enthusiastic about chess, you are as likely to find a truck driver as a mathematician among the world's best players. You are more likely to find an amateur psychologist or a journalist. In a way I am glad that my analytic approach to chess stymied my progress, because this helped me to see that there is more to skill than reasoning.<sup>6</sup>

When I asked Stuart Dreyfus in an interview where in the body a chess player feels that a move is right, he told me, "in the whole body. In the pit of the stomach."<sup>7</sup> It is similar, says Dreyfus, to asking where do you feel you are hungry when you are hungry. "You can't say that your brain thinks it is hungry," continues Dreyfus, "you experience your whole body as craving and the chess player has the same type of experience."<sup>8</sup> Dreyfus explains in the interview that when chess players play one-second-a-move chess, they describe a strange sensation that their hand is playing and they are not. "Their hand is just moving pieces as fast as it can and they almost feel as if their detached brain looks down at their hand playing chess," says Dreyfus, "so the whole body is even in that picture."<sup>9</sup>

Stuart Dreyfus touches here on two important general points. First, an exclusive use of analytical rationality tends to impede further improvement in human performance because of analytical rationality's slow reasoning and its emphasis on rules, principles, and universal solutions. Second, bodily involvement, speed, and an intimate knowledge of concrete cases in the form of good examples is a prerequisite for true expertise. We will return to these factors repeatedly in the following chapters.

Doctors and nurses say that experiences from working in an emergency ward are important for developing skills in clinical practice. The emergency room's patients are often acute cases with a broad range of different problems. Often there is no time to retrieve all the information one might want about the patient, and doctors on night duty will often not be able to obtain immediate aid from their more experienced colleagues. Doctors and nurses in an emergency room are therefore forced to think on their feet, i.e., to act quickly and to utilize spontaneously their experiences

from similar, prior situations. Thinking on their feet contributes to the development of intuition and judgment; prerequisites for becoming a good clinician. The emergency room situation contrasts with a ward for internal medicine, for example, where the doctor has more time, the patients have been there longer, the case histories are more detailed, the illnesses less acute and the outcomes more predictable.

#### *4. Proficient performer: beyond analytical rationality*

In the first three levels, the performer of a given skill has made a conscious choice of both goals and decisions after having reflected thoroughly over various alternatives, if the individual has not simply followed rules. Dreyfus and Dreyfus call this procedure the "Hamlet model" of decision-making.<sup>10</sup> In contrast to this model, decision-making for the proficient performer is more continuous and is not sequential in the same way. Proficient performers tend to be deeply involved in their actions and have evolved their perspective on the basis of prior actions and experiences.

This perspective enables certain key features of a situation to stand out, while others recede into the background. New actions and experiences change the predominant features, plans, and expectations, and with it the actions. No objective choice or conscious evaluation of appropriateness takes place, which is the case in selecting elements, rules, and plans. The choice is simply made, that much is clear phenomenologically speaking. And this seems to happen because the proficient performer has experienced similar situations earlier. Via spontaneous interpretation and intuitive judgment the memory of these situations generates plans corresponding to plans which have worked before. Similarly, memory of earlier situations releases expectations about actions, which correspond to those actions carried out in similar situations earlier.

The proficient performer understands and organizes her or his tasks intuitively, but intermittently continues to reflect analytically over what will happen. Elements and plans from the performer's experiences, which appear as intuitively important, are evaluated and combined analytically with the help of rules for reaching decisions about the most appropriate actions. Deep intuitive involvement in performance thus interacts with analytical decision-making.

To use one of Dreyfus and Dreyfus's examples, a proficient marketing manager keeps herself oriented about the market situation for her product by reading and listening to everything in her area, from formal reports to gossip in the field. One day the manager can intuitively decide that a problem or sales possibility exists, and that a new sales strategy should be considered. The manager then initiates a study of the situation and may



even take great pride in carrying out a sophisticated scientific market analysis, while overlooking the equally important ability to be able to identify the existence of the problem or possibility intuitively; this despite the fact that it was the manager's intuition which led to the marketing study being initiated in the first place.

### 5. *Expert*<sup>11</sup>

The proficient performer gradually achieves intimate experience from different situations, all of which touch upon the same goal and the same perspective, but which demand different tactical decisions. The proficient performer then perhaps achieves a level in which it is not only situations, which are recognized intuitively, but also – synchronically and holistically – the relevant decisions, strategies, and actions. According to Dreyfus and Dreyfus, this is the level of genuine, human expertise and is characterized by effortless performance. It is the level of virtuosity.

Expert soccer players assess the moment for dribbling or the possibility to score a goal by the entire visual situation in front of them, together with the sensations in their bodies releasing memories of earlier situations, where dribbling or attempts at scoring have succeeded. There is nothing which indicates that soccer players utilize general rules to combine various facts about their own and their opponent's positions, movement, speed, etc., and then select a course of action on this basis. Intuitive, holistic, and synchronous action is now at the center.

In normal, familiar situations, real experts do not solve problems and do not make decisions. They just do what "works." This does not mean that experts never think consciously, nor that they always do the right thing. When there is time, and when much is at stake, experts will also deliberate before they act. Their deliberation, however, is not based on calculated problem solving but on critical reflection over the intuition, which the expert applies. Even after this reflection, there will remain situations where the expert's decisions do not work. Unforeseen events may occur. And when one expert confronts another in competition, as in a championship chess or tennis match, only one of them can win.

Compared to rational decision-making, intuitive decision-making has been neglected as an object for scientific study, perhaps because science tends to emphasize analytical rationality as its own tool. Ultimately it is a question of what constitutes science, and whether it is possible to study phenomena such as intuition and synchronicity scientifically. Yet, we are familiar with most of these phenomena in their nonscientific form – seeing what needs to be done in an instant – when we perform in a craft, a sport, or making music.

◦ Where science does not reach, art, literature, and narrative often help us comprehend the reality in which we live.<sup>12</sup> Freud, who in many ways was a pioneer for research into human learning, thus saw writers as "valuable allies . . . [who in] their knowledge of the mind . . . are far in advance of us everyday people, for they draw upon sources which we have not yet opened up for science."<sup>13</sup> The late Danish novelist Hans-Jørgen Nielsen described virtuoso expertise in soccer and used a label for the virtuoso soccer player, which says it all: "soccer angel" (*fodboldengel*). Here are some "angels" in action:

We get a free kick, just within the other team's penalty zone, just to the right of the goal, and I take it, self-assuredly waving the others off, with the seductive movement which means that I and no one else knows what needs to be done. The opponents stand up in a wall in front of me in order to block a shot aimed at the goal, as I perhaps also had first thought, but suddenly, Franke stands next to them, far to the right, like an extension of their wall. This has happened during my approach, while everything is focused on me, and I keep running toward the ball as if to kick directly. When I get to it, I instead kick it in a very flat arc, over the defensive wall, and the ball would have taken the turf a few meters behind it. In the same moment, Franke has made his way around and has rushed toward the place where it would have landed. It never does, he catches it in the air with his right leg, half-gliding it into the goal with his left. No one else is able to grasp what has happened before he lifts his arms.

Soccer players tend to have this kind of thing with them from home, working on it over and over again during training. Franke and I have perhaps done something similar before, but never practiced it as something specific in this way, we don't exchange a word before I take the free kick, not even a telling glance, everything happens during the run-up, completely natural, he just stands there where he stands, I just play him like he has to be played when he has positioned himself where he has suddenly positioned himself, the thought doesn't even become anything we are so aware of that it can become clear for us in advance. It is a shared knowledge, from the perspective of the bodies and the eyes, ready to become reality, and it is prior to our being able to speak about it as a language and an ego . . . It lies prior to, or outside, sentences which must contain an I, you, he, she, it, in themselves . . .

Standing there, first genuinely surprised, then intensely happy, knowing right then and there that this very moment in the grey, luminous May evening, the teammates just away from me in a bunch around Franke . . . it is precisely this moment I will always remember . . . The fantastic thing is that the goal was successful in precisely this nonchalant, effusive way. This is what surprises me, and Franke, too; in any case he opens the bunch around him ever so slowly, comes toward me, while we eye each other, and gives me a little slap on the arm, like a receipt.<sup>14</sup>

Experts operate from a mature, holistic well-tried understanding, intuitively and without conscious deliberation. Intuitive understanding comes primarily from experiences on one's own body and is in this way at