

LAWYERING IN THE STATE OF NATURE: INSTINCT AND AUTOMATICITY IN LEGAL PROBLEM SOLVING

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INTRODUCTION

This article explains why lawyers do not think or talk like other people, how they got this way, and why this is both a good thing and a bad thing. I have watched hundreds of law students leave their old ways of thinking and talking behind and begin to sound like lawyers. One marker of the progress from lay person to lawyer is the emergence of the ability to tell a coherent fact and law story about a new legal problem. I have sometimes celebrated this professional progress and sometimes lamented the loss of common sense, but my lawyerly analysis could not explain that process or tell me how to influence it.

There is, however, a powerful, well-developed method outside of the law for studying that phenomenon. It is the cognitive science human problem solving model.¹ This article reports the results of a study using that model to analyze legal thinking. In short, lawyers do not think like other people because their thought is shaped by the particular structure of legal problems. They come to analyze problems in their distinctive way through repeated experiences with thinking and talking about the law, not because they are taught to think like lawyers in law school. It is a good thing that they develop their characteristic modes of thinking and talking, because if they did not they could not quickly and easily solve the many legal problems that they encounter. However, this approach also fosters typical lawyerly solutions and can make it very hard to think afresh about legal problems. Good or bad, the results of this study show that law students cannot be taught to think like lawyers by repeated analyses of appellate cases alone, nor by analyzing or emulating experienced legal thinking. Distinctive legal styles of thinking only develop when experience shapes substantive legal knowledge into individually constructed mental models.

The distinctive ways lawyers think about the law are determined primarily by the structure of legal problems and, to a lesser degree, by the way our brains work. Although we certainly make conscious choices as we think about the law, our analysis is also controlled and limited by unconscious and automatic cognitive processes. Even our reflective choices are bound by the structure of legal problems and our physical makeup.

The way we teach and talk about the law does not reflect the important differences among various kinds of legal problems, nor does it reflect the prominent role of these automatic and largely unconscious thought processes

1. This theory was elaborated upon and developed by Allen Newell and Herbert A. Simon in *HUMAN PROBLEM SOLVING* (1972) and remains the dominant model in problem solving research. See *infra* notes 37-40, 42-43, 45-54 and accompanying text.

in legal problem solving. This is true because we pay so little attention to what most lawyers actually do. Although many lawyers struggle to tame the vast, raw mass of facts presented by a new legal matter, law school classrooms and legal thought remain dominated by appellate cases and the doctrine-centric conception of what it means to "think like a lawyer."² That narrow focus has caused the academy to miss important differences in the ways lawyers approach different kinds of problems and to mistakenly confuse appellate lawyering for all of lawyering.

This article analyzes how we face the challenge of reasoning about both fact and law in a particular case by using the reigning cognitive science paradigm to analyze data collected in episodes of actual lawyerly reasoning.³ It provides a model of how legal and factual command over a specific area of the law⁴ allows lawyers to quickly, and largely unreflectively, analyze both facts and law together and how some thinkers can overcome imperfect factual knowledge. The study also shows that although we talk about applying facts to law, in the earliest phases of the lawyer's work on a case the facts and the law are integrated and become merely alternate expressions for the same ideas in the lawyer's mind. Our emphasis on doctrinal reasoning misses half the battle, which is waged simultaneously in the trenches of the facts and on the battlements of the law, and only accounts for one of the many styles of legal reasoning lawyers use.

Of course, facts have received attention from others. The notion that facts are easily known, static, and need only be plugged into doctrine by judges was debunked long ago.⁵ The observation that trial level fact finding

2. For examples equating doctrinal reasoning with all of legal thinking, or thinking like a lawyer, see EDWARD H. LEVI, AN INTRODUCTION TO LEGAL REASONING (1962); Sanford Levinson, *Taking Law Seriously: Reflections on "Thinking Like a Lawyer,"* 1030 STAN. L. REV. 1071, 1071-75 (1978) (reviewing RONALD DWORIN, TAKING RIGHTS SERIOUSLY (1977) (examining conceptions of thinking like a lawyer using appellate opinions); Cass R. Sunstein, Comment, *On Analogical Reasoning*, 106 HARV. L. REV. 741, 741 (1993) (calling analogy the "most familiar form of legal reasoning" and analyzing its use in appellate opinions); and Daniel Farber, *The Inevitability of Practical Reason: Statutes, Formalism, and the Rule of Law*, 45 VAND. L. REV. 533 (1992) (analyzing the application of practical reason to doctrinal reasoning). For a discussion of the doctrine centric view and other views of thinking like a lawyer, see generally Kurt Saunders & Linda Levine, *Learning to Think Like a Lawyer*, 29 U.S.F. L. REV. 121 (1994) (collecting and discussing doctrine-centric and other uses of the phrase "thinking like a lawyer" as a prelude to a study of what the concept means to first year law students). A separate strand in the literature discusses the ethical implications of "thinking like a lawyer." See, e.g., James R. Elkins, *Thinking Like a Lawyer: Second Thoughts*, 47 MERCER L. REV. 511 (1996) (discussing lawyerly thinking as amorally instrumental).

3. The study examines transcripts of lawyers and law students as they evaluate a simulated Social Security Disability claim.

4. The degree of specialized knowledge required may surprise those who view "good lawyering" as a generic ability, applicable to any legal question.

5. The fact-skeptic wing of the legal realist movement offered some of the first systematic studies of the role of facts in our legal system. See William Twining, *Talk About Realism*, 60 N.Y.U. L. REV. 329, 363 (1985).

is influenced by a host of factors which make it no more than our best approximation of what may have happened was controversial when Jerome Frank⁶ first made it, but this view is commonplace today. Many commentators have questioned the distinction between fact and law.⁷ Recent scholarship has built upon a more sophisticated view of factual proof to deepen our understanding of how lawyers construct persuasive factual records in court.⁸ The more fundamental recognition of the cognitive centrality of narrative has spawned the important body of narrative scholarship,⁹ which has moved the inquiry back another step from fact finding in litigation to the structure of persuasive factual accounts. Although some have developed a more textured and powerful understanding of factual accounts, the study of fact analysis remains limited by the still common habit of thinking about facts as they relate to appellate opinions, statutes, and other general statements of law. In that

6. See JEROME FRANK, *COURTS ON TRIAL: MYTH AND REALITY IN AMERICAN JUSTICE* 14-36 (1949) (chapter entitled *Facts are Guesses*).

7. Jerome Frank talked about the "gestalt" of judging. See *id.* at 165-85. Another example is Llewellyn's idea of "situation-sense," the understanding of the facts and law a judge uses to reach the correct, case-specific application of a rule, which has been interpreted in the light of cognitive science by Winter and pragmatism by Farber, as the imaginative identification of the correct cognitive model. See Steven L. Winter, *The Cognitive Dimension of the Agon Between Legal Power and Narrative Meaning*, 87 MICH. L. REV. 2225, 2263 (1989) [hereinafter Winter, *The Cognitive Dimension*] (reinterpreting situation sense using cognitive science); Farber, *supra* note 2, at 554. Hart and Sacks note that law declaration and fact identification "move in a flux." HENRY M. HART, JR. & ALBERT M. SACKS, *THE LEGAL PROCESS* 350 (1994). Bernard Jackson has expressed the idea as the "interdiscursivity of fact and law." BERNARD JACKSON, *LAW, FACT AND NARRATIVE COHERENCE* 92 (1988).

8. William Twining, who is both an evidence scholar, see TERENCE ANDERSON & WILLIAM TWINING, *ANALYSIS OF EVIDENCE: HOW TO DO THINGS WITH FACTS* (1991) [hereinafter *ANALYSIS OF EVIDENCE*], and a student of the Legal Realist Movement, see WILLIAM TWINING, *KARL LLEWELLYN AND THE REALIST MOVEMENT* (1985) [hereinafter *TWINING, LLEWELLYN*]; Twining, *supra* note 5, at 329, has written about facts in the trial court. *ANALYSIS OF EVIDENCE* is a modernized version of Wigmore's chart method and offers a structured method for analyzing and teaching the analysis of proof at trial. See James L. Kainen, *The Rationalist Tradition at Trial*, 60 FORDHAM L. REV. 1085 (1992) (reviewing *ANALYSIS OF EVIDENCE*). Twining has long urged more study and teaching of the skill of "fact handling" and argues that law students and lawyers need formal training in principles of logic to properly assemble a persuasive evidentiary record. See William Twining, *Taking Facts Seriously*, 34 J. LEGAL EDUC. 22 (1984).

9. The centrality of narrative in communicating conventionalized meaning and persuasion has been explored in narrative scholarship. See Richard Delgado, *Rodrigo's Final Chronicle: Cultural Power, the Law Reviews, and the Attack on Narrative Jurisprudence*, 68 S. CAL. L. REV. 545 (1995) (collecting scholarly discussion and defending narrative in narrative form). The argument over narrative scholarship is not about the cognitive insight regarding the importance of narrative as a mental structure or the importance of using and hearing narrative in the activity of lawyering; the scholarship has been criticized for claiming too much for the power of narrative to justify legal rules. See Daniel A. Farber & Suzanna Sherry, *Telling Stories Out of School: An Essay on Legal Narratives*, 45 STAN. L. REV. 807 (1993). Winter argues that narrative is a powerful tool for persuasion but states that claims of legitimation must be more general, unreflexive and reliable than narrative structures. See Winter, *The Cognitive Dimension*, *supra* note 7, at 2228, 2259. See also JACKSON, *supra* note 7, at 92. ("[W]e may find reason to be skeptical of the law/fact/application distinctions at the level of decision-making, while taking full account of them at the level of justification.") (emphasis in original).

style of analyzing lawyerly thinking, fact analysis is either bracketed and assumed away,¹⁰ or is studied for its often unstated impact on a judge's opinion, in which the facts already have been drained of most of their power. We may analyze how a judge stresses or ignores a fact to support an outcome, but appellate case analysis is not a vehicle for studying how facts are included or excluded from the record altogether. Nor is it a vehicle for studying how lawyers assemble the particular records which constrain courts, even as they leave some room at the margins for judging.

This Article studies factual and legal analysis at the earliest stage of a case, when the lawyer first asks, "What shall I do in this new legal situation?"¹¹ It uses the cognitive science human problem solving model. This powerful analytic tool has been applied to other disciplines, including medicine, physics, mathematics, business management, the social sciences and writing.¹² Although others have noted the promise this model holds for deepening our understanding of legal analysis,¹³ this study is the first application of the human problem solving model to representational lawyering.¹⁴

Studies using the model in other disciplines show that experienced thinkers knowledgeable in a particular area¹⁵ use different cognitive operations

10. In the second edition of AN INTRODUCTION TO LEGAL REASONING, Levi gave this response to Jerome Frank's criticism that the book ignored the role of trial level fact finding in shaping the law:

[T]he process described in this essay is recognizable as dealing just as much with fact determination or categorization as with rule-making. One can accept the persuasiveness of the legal concept as a rule of thumb, and particularly so at the trial or at an earlier stage, and yet marvel at the numerous possibilities, more open at the trial than appellate level, to shape the case by an interpretation of the facts in light of a re-examination of the law.

LEVI, *supra* note 2, at v-vi. This article looks closely at some of the "numerous possibilities," at an even earlier stage in the process, to which Levi only adverts. *Id.*

11. See *infra* notes 28-35 and accompanying text.

12. See, e.g., Guy Groen & Vilna Patel, *A View From Medicine*, in TOWARD A UNIFIED THEORY OF PROBLEM SOLVING: VIEWS FROM THE CONTENT DOMAINS (Mike U. Smith ed. 1991) [hereinafter VIEWS FROM THE CONTENT DOMAINS]; Yuichiro Anzai, *Learning and Use of Representations for Physics Expertise*, in TOWARD A GENERAL THEORY OF EXPERTISE (K. Anders Ericsson & Jacqui Smith eds., 1991) [hereinafter GENERAL THEORY OF EXPERTISE]; James Greeno, *A View of Mathematical Problem Solving in School*, in VIEWS FROM THE CONTENT DOMAINS, *supra*; Daniel Isenberg, *Thinking and Managing: A Verbal Protocol Analysis of Managerial Problem Solving*, 29 ACAD. OF MGMT J. 775 (1986); James Voss et al., *Problem Solving Skill in the Social Sciences*, 17 PSYCHOL. OF LEARNING AND MOTIVATION 165 (1983); Marlene Scardamalia & Carl Bereiter, *Literate Expertise*, in GENERAL THEORY OF EXPERTISE, *supra*.

13. See *infra* notes 19-26 and accompanying text.

14. The first application of this model to law was made by Jeanette A. Lawrence, in *Expertise on the Bench: Modeling Magistrate's Judicial Decision-Making*, in THE NATURE OF EXPERTISE (Michélene T.H. Chi et al. eds., 1988) (studying two experienced and one aspiring Australian Magistrate, each of whom reviewed and analyzed three simulated drunk driving cases in preparation for imposing sentence).

15. The relevant area of knowledge is usually narrow, often a professional subspecialty. For

to solve problems in their areas of expertise than do those lacking area-specific experience. The expert's cognitive techniques are characteristically fast and unconscious. This study shows that the same is true in the law.¹⁶

The model also predicts that problem solvers will choose among a limited number of general ways of solving a problem, each leading to the same answer.¹⁷ In this study, the solvers fell into two groups, "fact solvers" and "law solvers." At this early stage of a case, statements of fact and law can be alternate expressions of the same information.¹⁸ At the earliest stage of a case, a lawyer is thinking about specific legal propositions made relevant by the facts and specific factual propositions made relevant by the law. As a case progresses through the courts and facts are "found" and held relatively constant by rules of deference to fact-finding (in order to permit generalization and emergence of legal principles), the relationship between fact and law changes.

This Article is a contribution to the emerging body of clinical scholarship about "what lawyers actually do in performing the various tasks that lawyers perform."¹⁹ This scholarship has already been strongly influenced by

doctors it would be a particular area of medicine such as cardiac surgery or radiology, not medicine generally. In problem solving, the broader area is a domain of knowledge, while the specialized area of knowledge is a subdomain.

16. This study suggests that the differences between experienced and inexperienced legal problem solvers are consistent with the predictions of the human problem solving model. The experienced thinkers saw deeper patterns and used different processes to apply their particular, or domain-specific, knowledge quickly and accurately. Novices tended to focus on surface features; when they applied rules, they used cognitive strategies that operated more slowly and led to incomplete answers. See *infra* Part III A.

17. According to the model, each method uses alternate terms to express the same underlying ideas, so comparisons between the two can reveal deeper aspects of the structure of the problem.

18. The relationship between facts and law has received attention from the legal realists. See JEROME FRANK, *LAW AND THE MODERN MIND* 125 (1963) ("The judge, in arriving at his hunch, does not nicely separate his belief as to the 'facts' from his conclusion as to the 'law'; his general hunch is more integral and composite, and affects his report—both to himself and to the public—concerning the facts."), the legal process school, see HART AND SACKS, *supra* note 7, at 349-62 (defending the view that the distinction is not merely functional, but relying upon institutional and process based justifications for the distinction), and from the critical theorists, see JACKSON, *supra* note 7, at 262-63 (arguing that fact and law are not distinct analytic categories).

19. Anthony G. Amsterdam, *Telling Stories and Stories About Them*, 1 *CLINICAL L. REV.* 9, 10 (1994) [hereinafter Amsterdam, *Telling Stories*]. This scholarship typically offers "micro-analysis" of transcripts of interviews, arguments and other lawyering activities. See Peggy Davis, *Contextual Legal Criticism: A Demonstration Exploring Hierarchy and "Feminine" Style*, 66 *N.Y.U. L. REV.* 1635 (1991) (analyzing transcripts of simulations of lawyer-client interviews); Anthony G. Amsterdam & Randy Hertz, *An Analysis of Closing Arguments to a Jury*, 37 *N.Y.L. SCH. L. REV.* 55 (1992) (analyzing transcripts of the closing arguments in a criminal case); Linda F. Smith, *Interviewing Clients: A Linguist Comparison of the "Traditional" Interview and the "Client Centered" Interview*, 1 *CLINICAL L. REV.* 541 (1995); Gay Gelhorn et al., *Law and Language: An Interdisciplinary Study of Client Interviews*, 1 *CLINICAL L. REV.* 245 (1995). Of course, one law-craft—appellate court opinion writing—is the subject of much traditional legal scholarship. One sign of the vitality of lawyering scholarship, and perhaps a sign of its difficulty in finding a home, is the peer-reviewed *Clinical Law Review*, which is committed to publishing a variety of

cognitive science.²⁰ Cognitive science, in turn, has roots in philosophical pragmatism, with its emphasis on thought as an activity in the world.²¹ Clinical legal thought, which analyzes law as an activity,²² and attends closely to perspective (role) and context,²³ owes a debt to pragmatism which can be traced through legal realism.²⁴ This article begins to repay the debt clinical

clinical scholarship.

20. Cognitive science insights already play an important, explicit role in lawyering scholarship. Amsterdam's much cited article *Clinical Legal Education—A 21st Century Perspective*, 34 J. LEGAL EDUC. 612 (1984) [hereinafter Amsterdam, *21st Century Perspective*] uses the language of Allen Newell and Herbert A. Simon's human problem solving model, conceiving solving as a search through a problem space. See generally Amsterdam & Hertz, *supra* note 19; Gary L. Blasi, *What Lawyers Know: Lawyering Expertise, Cognitive Science, and the Functions of Theory*, 45 J. LEGAL EDUC. 313, 328 n.32 (1995) [hereinafter Blasi, *What Lawyers Know*]. Professor Blasi's rich and insightful article sets clinical scholarship in the cognitive science framework and argues for a pragmatic understanding of theory in lawyering scholarship. He has applied some of the same insights to other uses of theory in *What's a Theory For?: Notes on Reconstructing Poverty Law Scholarship*, 48 U. MIAMI L. REV. 1063 (1994) [hereinafter Blasi, *What's a Theory For?*].

Cognitive science has also received attention from other legal academics, most importantly, Steven L. Winter. See Steven L. Winter's *Transcendental Nonsense, Metaphoric Reasoning, and the Cognitive Stakes for Law*, 137 U. PA. L. REV. 1105 (1989) [hereinafter Winter, *Transcendental Nonsense*]; Winter, *The Cognitive Dimension*, *supra* note 7, at 2263.

Other examples include Pierre Schlag, *Missing Pieces: A Cognitive Approach to Law*, 67 TEX. L. REV. 1195 (1989) (arguing that differing stances stem from incommensurable cognitive positions, only one of which uses cognitive science); Farber, *supra* note 2, at 554 (comparing the cognitive science notion of expertise to practical reason and Llewellyn's "situation sense"); Edwina L. Rissland, *Artificial Intelligence and Law: Stepping Stones to a Model of Legal Reasoning*, 99 YALE L.J. 1957 (1990); Patrick J. Ryan, *A Mental Model of Civil Procedure*, 28 RUTGERS L.J. 637 (1997); Mark Neal Aaronson, *We Ask You to Consider: Learning About Practical Judgment in Lawyering*, 4 CLINICAL L. REV. 247, 291-96 (1998) (discussing the contribution of the cognitive science expert novice distinction to the idea of practical judgment).

21. The cognitive science problem solving model is pragmatic in its observationally developed, instrumentalist, reason-experience integrating, biologically based and highly context sensitive view of the mind. Thomas C. Grey, *Holmes and Legal Pragmatism*, 41 STAN. L. REV. 787, 801 (1989) (identifying these broad themes in pragmatism). Other recent attention to pragmatism in the law includes Daniel A. Farber, *Legal Pragmatism and the Constitution*, 72 MINN. L. REV. 1331 (1988); Steven D. Smith, *The Pursuit of Pragmatism*, 100 YALE L.J. 409 (1990); *Symposium. The Renaissance of Pragmatism in American Legal Thought*, 63 S. CAL. L. REV. 1569 (1990) (presenting work by Thomas C. Grey, Frank Michelman, Richard A. Posner, Margaret Jane Radin and Cornel West, among others); Richard Rorty, *Comment, The Banality of Pragmatism and the Poetry of Justice*, 63 S. CAL. L. REV. 1811 (1990); Richard A. Posner, *What Has Pragmatism to Offer Law?*, 63 S. CAL. L. REV. 1653 (1990).

22. See, e.g., Phyllis Goldfarb, *Beyond Cut Flowers: Developing a Clinical Perspective on Critical Legal Theory*, 43 HASTINGS L.J. 717 (1992).

23. See Martha Minow & Elizabeth V. Spelman, *In Context*, 63 S. CAL. L. REV. 1597 (1990) (discussing context as pragmatic theme and defending its centrality against charges of epistemic and political particularism). The human problem solving model predicts that there will be important differences in cognitive processes depending upon the content and context of the problem at hand. Newell and Simon's focus on puzzles with determinate solutions tends to underplay the importance of context. See *infra* Part I.

24. On the relationship between the realists and pragmatism, see TWINING, LLEWELLYN, *supra* note 8, at 8.

thought owes to pragmatism and the realists by following their urging to study lawyering²⁵ and "[to take] facts seriously."²⁶

This Article has four sections. Part I discusses recent attention to legal problem solving at the earliest stages of a case, before there has been the creation of a binding factual record and presents Newell and Simon's human problem solving model—solving as a search through a problem space using domain-specific knowledge and search techniques.²⁷ Part II discusses the application of the model as an analytic framework for study of lawyerly problem solving. Part III presents two results of the study: the expert/novice distinctions observed in other domains are also found in the law, and the solvers consistently used one of two general ways of thinking about the problem, one law oriented and one fact oriented. Part IV argues that although we can set up the conditions in which law students can develop their lawyerly thinking, we cannot directly teach them to think like lawyers. Each of us must take responsibility for the version of lawyerly thinking that we have developed for ourselves.

I. PROBLEM SOLVING

What does a person (lawyer) do when faced with a new (legal) situation?²⁸ The MacCrate Commission²⁹ report, the most recent and influential catalog of lawyering skills and values, gives problem solving a prominent place. The MacCrate Report's Statement of Skills and Values begins its list of fundamental lawyering skills "with two analytical skills that are conceptual foundations for virtually all aspects of legal practice: problem

25. The realists' interest in lawyering took several forms. Frank was among the first to advocate clinical instruction as a method of education. See Jerome N. Frank, *Why Not a Clinical Lawyer-School?*, 81 U. PA. L. REV. 907 (1933). Llewellyn turned more toward the study of lawyering over time, calling for greater focus on "effective lawyering" through the study of the "crafts of lawyering," or "concrete work held close to earth . . . done against a background of solid theory, at least of theory about the sound methods of going about the job." KARL LLEWELLYN, *THE BRAMBLE BUSH* 184 (1960).

26. Twining, *Taking Facts Seriously*, *supra* note 8, at 22.

27. See generally NEWELL & SIMON, *supra* note 1.

28. That question, without the parentheticals, is central to pragmatism. See Grey, *supra* note 21, at 801 (citing JOHN DEWEY, *ESSAYS IN EXPERIMENTAL LOGIC* 225 (1916)). It is also Newell and Simon's central question, see *supra* note 1, at 72, and the question posed by Anthony Amsterdam, in *21st Century Perspective*, see *supra* note 20.

29. See AMERICAN BAR ASSOCIATION SECTION OF LEGAL EDUCATION AND ADMISSIONS TO THE BAR, *LEGAL EDUCATION AND PROFESSIONAL DEVELOPMENT—AN EDUCATIONAL CONTINUUM REPORT OF THE TASK FORCE ON LAW SCHOOLS AND THE PROFESSIONS: NARROWING THE GAP* (1992) [hereinafter, MacCrate Report].

solving (Skill §1) and legal analysis (Skill §2).³⁰ The report urges us to "be familiar with the skills and concepts involved in problem solving."³¹

Consistent with its aim, the MacCrate Report catalogs the types of problems lawyers typically need to solve, but it does not analyze the solving process.³² This study fills that gap. It uses the MacCrate Report as a starting point and suggests that understanding how lawyers perform the deceptively commonplace activities listed in the report is really quite complicated and deserving of serious study.

Legal thinkers have written about legal problem solving at the earliest stages of a case, but none have studied its details. Professor Gerald López has analyzed the resolution of a dispute outside of a formal legal context.³³ López uses a cognitive science oriented approach to analyze how stories form the core of our everyday persuasion. He sees lawyering through our common experience of helping others solve everyday problems.³⁴ This article looks at the details of problem solving.³⁵ Professor Gary Blasi adopts López's focus on the initial conceptualization of a problem and discusses the application of the human problem solving model to lawyering.³⁶ This article takes on Blasi's challenge to apply the model.³⁷

30. *Id.* at 135. Although there is much written on appellate legal analysis, the commentary to Skill §2 notes that the Commission's analysis departs "from the traditional case-method approach" by emphasizing contexts in which the facts are still being developed and the lawyer does not yet have complete knowledge of the law. *Id.* This project involves such a context and treats the two skill areas as significantly interdependent.

31. *Id.* at 156. In the commentary to Skill §1, Problem Solving, the MacCrate Report references Amsterdam's *21st Century Perspective*, *supra* note 20, and uses the language of the human problem solving model.

32. *See id.*

33. Gerald P. López, *Lay Lawyering*, 32 UCLA L. REV. 1 (1984) (analyzing how two claimants to a single taxicab can resolve their dispute). This Article is a more formalized application of Professor López's observations about problem solving to an explicitly legal problem.

34. *See id.*

35. *See infra* notes 66-67. Problem solving is a context sensitive activity.

36. Blasi, *What Lawyers Know*, *supra* note 20, at 327-29 (applying the problem solving model's notions of expertise to developing theories of lawyering and theory development and citing López, Binder and Price, Amsterdam, Winter, and Newell and Simon). This Article builds on Blasi's project by offering observational application of the problem solving model in the context of a more explicit discussion of its pragmatic roots.

For other commentators who draw on the problem solving literature, *see* Farber, *supra* note 2; Saunders & Levine, *supra* note 2; Anthony Palasota, *Expertise and the Law: Some Recent Findings from the Cognitive Sciences About Complex Human Information Processing*, 16 T. MARSHALL L. REV. 599 (1991). Interest in lawyerly cognitive processes extends to the classroom. *See also* Mary Crystal Cage, *Stanford Law School Experiments With a Course That Teaches Students to Think Like Lawyers*, CHRON. OF HIGHER EDUC., September 13, 1996, at A16 (describing application of cognitive science problem solving insights in classroom teaching).

37. No discussion of lawyerly problem solving would be complete without mention of David A. Binder et al., *LAWYERS AS COUNSELORS: A CLIENT-CENTERED APPROACH* (1991), which put the idea of lawyers as problems solvers at the core of our notion of the lawyerly role. They write:

The human problem solving model was developed by two cognitive scientists,³⁸ Allen Newell³⁹ and Herbert A. Simon.⁴⁰ The model uses the spatial metaphor of problem solving as a search through space, starting at a point defined by the initial question and moving along a path from one partial answer to another until the final answer is reached. The search metaphor reflects the view that human problem solving is best understood as occurring within a finite and closed universe⁴¹ of possible solutions through which the solver searches. We search through a limited⁴² set of possible solutions, rather than performing other kinds of operations with general rules or conditions. The search idea also reflects the uncertain, non-linear nature of the process. We search for a solution that we believe exists, but we do not quite know where to find it.

The search metaphor is also part of a more general view of the mind as an information processing system with certain definable characteristics. The gross characteristics are our short term and long term memory. We attend to and process information in our short term memory, which is limited in capacity.⁴³ Our long term memory can be accessed in a predictable way and has its own structural limitations.⁴⁴

Clients come to lawyers seeking help in solving problems But no matter who the client, what the substantive legal issues or whether the situation involves litigation or planning, your principal role as lawyer will almost always be the same—to help the client achieve effective solutions to their problems.

Id. at 2-3. David A. Binder, Paul Bergman and Susan C. Price use that formula to expand the definition of the lawyer's role to include helping clients address non-legal aspects of their problems. *See id.* Their focus, however, is on the professional skills rather than the cognitive processes lawyers use.

38. Cognitive science combines cognitive psychology, computer science, neuroscience, linguistics and philosophy to study human thought. *See generally* HOWARD GARDNER, *THE MIND'S NEW SCIENCE* (1985); Herbert A. Simon & Craig Kaplan, *Foundations of Cognitive Science*, in *FOUNDATIONS OF COGNITIVE SCIENCES I* (Michael Posner ed., 1989) (offering general introductions to the field of cognitive science).

39. Allen Newell had a long and fruitful career in the computer science department at Carnegie Mellon University.

40. Herbert A. Simon started his academic career as an organizational theorist and won the Nobel Prize in Economics in 1983.

41. NEWELL & SIMON, *supra* note 1, at 819.

42. The problem space is limited in size, typically containing from a few dozen symbols to a few hundred, at most. Residence time in a particular knowledge state is of the order of seconds; solvers remain in a given problem space for periods of at least tens of minutes. *See id.* at 811.

43. Its limits can be stretched. *See* K. Anders Ericsson & Jacqui Smith, *Empirical Study of Expertise: Prospects and Limits*, in *GENERAL THEORY OF EXPERTISE*, *supra* note 12, at 28-31.

44. The first two of the four basic propositions of the theory address the idea that the structure of the mind specifies a problem space. They are:

1. A few, and only a few, gross characteristics of the human Information Processing System are invariant over task and problem solver.

2. Those characteristics are sufficient to determine that a task environment is represented as a problem space and problem solving must take place in a problem space.

NEWELL & SIMON, *supra* note 1, at 778.

Newell and Simon's model is the central construct in the field of problem solving⁴⁵ and grew out of their work recording and analyzing subjects' verbalizations of their thoughts (verbal protocols)⁴⁶ as they solved puzzles and logic games.⁴⁷ For example, Newell and Simon analyzed the solving of this cryptarithmic puzzle:

$$\begin{array}{r} \text{DONALD} \quad D=5 \\ +\text{GERALD} \\ \hline \text{ROBERT} \end{array}$$

Each letter represents a number, and the sum of the numbers represented by the first two lines equals the numbers represented by the third line. The solver is told that $D = 5$, although it is possible to solve the puzzle without that information.⁴⁸

Their very detailed and technical analysis is offered in full in their treatise⁴⁹, and the following very brief overview is only intended to provide a basic outline of their method. The analysis of the solving of the DONALD + GERALD problem begins with the identification of the possible sets of solutions through which a solver might search. These sets of answers are known as "problem spaces."⁵⁰ Initially the solver considers the simplest sets of solutions, those in which the two most basic solving methods can be used to search for the right answer. The first method is to list every solution and test each one. That method requires a problem space listing all 362,480 possible solutions and some way to test each in turn. It is not a useful strategy

45. See *id.* Newell and Simon are the seminal figures in a rich and influential body of work exploring problem solving generally and its specific application in a number of disciplines. Although their book explores problems that have determinant solutions and can be done in under thirty minutes, their theory is more generally applicable. Their original work was highly search-oriented. They hoped to find a few, powerful and general search methods. Research proved that the accumulation and structuring (categorization) of knowledge was more important than search, but their basic work, now extended in the direction of structured knowledge, remains paradigmatic.

46. See generally K. ANDERS ERICSSON & HERBERT SIMON, *PROTOCOL ANALYSIS: VERBAL REPORTS AS DATA* (1984). This is the standard work on protocol analysis. Some methodological issues are discussed *infra* at Part II.C.

47. Newell and Simon's problems were "short (half hour), moderately difficult . . . [and] of a symbolic nature." NEWELL & SIMON, *supra* note 1, at 4. Their choice of tasks reflected both the need for relatively simple problems that could be modeled on the computers of the 1960s and the goal of understanding generic problem solving at a cognitive level with a search-oriented model. They argued that "[r]estricting the discussion to symbolic entities and processes does not severely limit our analysis of the problem solving For the crucial activities, at least in human problem solving of any complexity, are symbol-manipulating activities that take place centrally." *Id.* at 72.

48. See NEWELL AND SIMON *supra* note 1.

49. See *id.*

50. The problem space is the set of all possible solutions to the problem.

for a human solver, although simple computer programs might solve the problem that way.⁵¹

The second basic method is heuristic search.⁵² Heuristics are useful strategies that usually, but may not always, lead to the right answer. For example, knowing only that each letter is assigned to one number, $D = 5$, and that $DONALD + GERALD = ROBERT$, a solver can try out a value for a given letter and work through the problem until one of the three known answers appears incompatible. A solver then picks a different number and tries it. By substituting a different number at that point, rather than continuing to find additional proof that the first number was wrong, a solver has vastly reduced the number of possible solutions that he or she must test.⁵³ In addition to using heuristics, virtually every solver will improve his or her solving process as it moves along by including information learned during the solving. This new information becomes part of the set of solutions and turns that set into an "augmented problem space."⁵⁴ Almost all successful solvers of the $DONALD + GERALD$ problem used one of only two different "augmented problem spaces."⁵⁵

51. In information processing terms, this "generate and test method" also requires more information than is presented by the problem statement alone.

52. Rather than being a search for a correct solution (goal), the process is reconceived as a search for a path from an initial element in the problem space to a desired element. The increased power of this reconceptualization comes from using information gleaned in the search. They offer the example of safecracking. The generate and test method of solving would have us try every possible combination of numbers. Assume, however, that the lock makes a faint click every time a tumbler falls into place (the stethoscope to the dial). If the safe has ten independent dials, the generate and test method requires searching ten elements. Listening for the clicks would require an average of fifty tries per dial or a total of five hundred trials to open the safe. See NEWELL & SIMON, *supra* note 1, at 98. In this example, the heuristic search method is very powerful because it is highly selective and generates all and only admissible solutions. Not many heuristics prove that powerful. It is important to understand heuristics not as proofs or methods that only lead to right answers but as strategies that narrow choices, identify pieces of the solution path and provide other kinds of help in finding the right solution in the problem space.

Newell and Simon's empirical work shows that there are a limited number of heuristic search strategies for a given problem. Heuristics are not idiosyncratic or infinitely varied from solver to solver or domain to domain. The whole set of methods is large, but not an independent variable in the specification of the task environment, the goals of the problem solver and the selection of the problem. Although the choice of a particular heuristic method is partially dependent on the solver's intelligence and education, his or her choices are highly circumscribed by the task and goals. See *generally id.*

53. Technically, the solver has used the heuristic of stopping the search of a whole branch of the solution tree as soon as a single value which violates any of the three known conditions is found to contract the size of the problem space through which he or she must search. See *id.* at 150-51.

54. *Id.* at 152. As solving moves along, it may be possible to infer that a given letter must correspond to an even number, must be greater or lesser than a given value or cannot be assigned to a particular number. More goal information will decrease the size of the problem space and simplify testing after generation.

55. *Id.* One took the individual assignment of digits to letters as the relevant states of knowledge. The second analyzed and manipulated the constraints themselves. Although specification of the actual mental representations is always a matter of inference from the evidence of the verbal protocols, the first

In this model the mind has a relatively simple task. It has only a limited number of operations to bring to bear on any problem. The problem, not the mind, determines the various possible solutions which make up the "structures" of the problem space. The details and complexities of solving any particular problem vary with, and are a function of, the problem, because the mind is by far the simpler and less variable component in the system. This aspect of the theory captures its profound content orientation⁵⁶ and context sensitivity.⁵⁷ Often, a problem will present more than one set of "clues" or ways of expressing and reaching the solution. Each solver will probably take advantage of only one set of clues and construct a problem space of some subset of the total set of solutions.⁵⁸ Because problem solving is determined by content, each area, or domain, of knowledge requires separate examination to determine the particular kinds of solving appropriate to that domain.

II. APPLYING THE HUMAN PROBLEM SOLVING MODEL TO LAWYERING

A. Lawyering as an Ill-Structured Problem

Lawyers do not solve cryptarithmic problems. Lawyers who represent clients at the early stages of a case face problems that cannot be reduced to a single clearly stated question and that probably do not have a single, demonstrably correct answer. In technical terms, lawyering problems cannot be fully specified in a formal system.⁵⁹ The problem, the answer and the set

augmented space can be conceptualized as one in which each node is a set of possible values for a given letter, i.e., $R=7$ or 9 , or R is less than 5 . In this problem space, information about the relations of disjunction, inequality and parity is added to the problem specification of the letters, digits and the assignment relationship between them.

In the second augmented space, information about the relations of disjunction, inequality and parity is admissible, as above, plus information about arithmetic relations using the operations of addition, subtraction, multiplication and division. This space may be represented by a series of algebraic equations, a notation that permits consideration of the arithmetic information. The addition of this information permits reduction of the size of this problem space and permits relatively rapid solution. Each of these different problem spaces is a problem formulation that presents all the elements necessary to solve the problem.

56. See *id.* at 810.

57. Newell and Simon's third and fourth propositions of the theory, which focus on context and content sensitivity, are: 3. The structure of the task environment determines the possible structures of the problem space; and 4. The structure of the problem space determines the possible programs that can be used for problem solving. *Id.* at 789.

58. Typically there are only very few problem spaces available.

59. Russell and Whitehead's PRINCIPIA MATHEMATICA offers the classic modern example of an effort to construct a complete formal system. See BERTRAND RUSSELL & ALFRED N. WHITEHEAD, PRINCIPIA MATHEMATICA (1950). See generally JUSTIN LEIBER, AN INVITATION TO COGNITIVE SCIENCE (1991) (discussing the relationship between a formal system like Russell and Whitehead's and cognitive science). The property of being "fully specified" is a deep theoretical problem. For this work "full

of all possible solutions (the problem space) for puzzles and logic games can all be reduced to a set of formulae. In lawyering, clients usually present complex factual scenarios which raise many different and often initially muddled issues. The set of all the possible things one might do to deal with the client's situation (the problem space) is very large. Choosing among the many different courses of action requires the lawyer to weigh many interdependent variables, none of which he can evaluate with certainty.⁶⁰

The lawyer's proper goals are the subject of great debate among the legal community and even when we can agree on our goals, it is very hard to find good measures of success.⁶¹ We know when we have found the right answer to the puzzle, but unless the result of our lawyering is clearly bad, we are hard-pressed to confidently say more than that we found a reasonable way to help our client. Cognitive scientists call hard problems, like lawyering problems, "ill-structured" problems.⁶²

Cognitive scientists have studied ill-structured problems in several different areas of knowledge, or domains, including the social sciences, writing and business management.⁶³ The central cognitive challenge posed by ill-structured problems is essentially one of scale, caused by their many contingencies.⁶⁴ In search terms, contingencies create exceedingly large problem spaces which quickly become a very complex web of interdependent possibilities. Solving ill-structured problems is like walking through a forest with many different sets of trails. We must go one way or another at a fork, and we have neither the time nor trail mix to hike every trail.

Simon has suggested that ill-structured problems require expending considerable effort to structure or organize the problem and relatively less to solve the problem once it has been structured.⁶⁵ The two views of ill-

specification" can be identified with what Lakoff calls analyticity, see GEORGE LAKOFF, *WOMEN, FIRE AND DANGEROUS THINGS: WHAT CATEGORIES REVEAL ABOUT THE MIND* 130 (1987). In a system of categories defined by essential properties and correspondences, things can be assigned labels that capture their full meaning, rather than names that sort them into a category for a given purpose. That determinate labeling is one aspect of full specification.

60. See generally Colin F. Camerer & Eric J. Johnson, *The Process-Performance Paradox in Expert Judgment: How Can Experts Know So Much and Predict So Badly?*, in *GENERAL THEORY OF EXPERTISE*, *supra* note 12 (discussing special cases and noisy (data rich) systems with few replications).

61. See Voss, *supra* note 12, at 169 (discussing similar problems in the social sciences).

62. James Voss & Timothy Post, *On the Solving of Ill-Structured Problems*, in *THE NATURE OF EXPERTISE*, *supra* note 14, at 261.

63. See *supra* note 12.

64. W. R. Reitman called contingencies "open constraints," in his important analysis of ill-structured problems. Voss & Post, *supra* note 58, at 261. There is a continuum of problems from most to least structured, depending on the number of open constraints. A particular ill-structured problem may have well-defined constraints at some points and open constraints at other points. See *id.*

65. See *id.* at 262. Typically, breaking an ill-structured problem into better structured small pieces (decomposition) and selection of parameter values for open constraints relative to the goals at hand, are

structured problem solving: (1) choosing one contingency over another or (2) organizing the problem to reduce the number of solutions we must search (reduce the size of the problem space), are opposite sides of a coin, reducing the scale of the problem so that our limited cognitive faculties can manage it. From many possible starting points, leading to many different paths, the solver must choose one starting place, go down one path that hopefully heads, according to a goal the solver has chosen, in the right general direction.

B. The Choice of Initial Assessment of a Social Security Disability Case as the Task to be Studied

The lawyering problem examined here, an initial evaluation of a Social Security Disability (SSD) claim, is difficult enough to generate data on how lawyers deal with typical lawyerly problem solving challenges, but not so difficult as to produce too much data to analyze. It can be modeled with a brief problem⁶⁶ and analyzed, to some degree, in a reasonable period of time.⁶⁷ Thus, it fits within the constraints of Newell and Simon's method and is a typical lawyering activity; every lawyer does some kind of evaluation at the early stages of client representation.

Initial assessment of a case must not be mistaken for all of lawyering. Lawyers do many other things and a broader analysis of lawyering must also account for social and other contextual factors.⁶⁸ In addition, this broader analysis must discuss variations in a lawyer's ability to carry out the solutions that they identify.⁶⁹ Although the particular activity is only one of many, much of lawyering involves problem solving activities. If a lawyer thought it essential to interview the claimant before thinking about the case in the way

keys to dealing with the lack of specification of the initial state of an ill-structured problem. See *id.* at 265.

66. See *supra* note 45 (use of thirty minute problems).

67. The choice of this particular task also imposes limitations on the reach of this research. This is not an attempt to model the complex problem solving lawyers engage in to address a client's whole situation; rather, it is only a discussion of some of the cognitive processes used in initial evaluation. By design, the client is presented to the subjects of the study lawyer as an abstract construct represented by a thin file of forms. I have sympathy for the view that the client in the richness of his or her social situation, as the central player in an empowering social interaction, is the proper starting point for any analysis of lawyering, but I believe it is important to sort out the cognitive details before addressing the inescapable and central normative questions. See generally Anthony V. Alfieri, *Impoverished Practices*, 81 GEO. L.J. 2567 (1993).

68. See generally *id.* The pragmatism of the cognitive science problem solving model is sympathetic to and consistent with analyses of lawyering emphasizing the importance of social and political context.

69. This research does not address the role of technique and individual differences in mastery of technique (called "production proficiency" in the cognitive science literature) in lawyering. Timothy Salthouse, *Expertise as the Circumvention of Human Processing Limitations*, in GENERAL THEORY OF EXPERTISE, *supra* note 12, at 290-91.

these lawyers did, that lawyer is not withholding or postponing problem solving. The solution of speaking to the client first is still the result of a search through a problem space, albeit a different one, informed by a different goal.⁷⁰

SSD cases are a staple of poverty law. Millions of Americans receive benefits predicated upon an official determination that they are disabled⁷¹ and many claimants challenge the government over their eligibility for these benefits. The legal framework, well described elsewhere,⁷² consists of the organic statutes,⁷³ regulations,⁷⁴ agency rulings⁷⁵ and federal court decisions on SSD cases.⁷⁶ There are many of these cases and there is a large group of lawyers, law students and paralegals at differing levels of training and experience who can be studied and compared.

This area of the law is both circumscribed and reasonably complicated, but still accessible to a wide range of advocates. These qualities make it particularly well-suited to the study of problem solving because it presents typical problems of "law application"⁷⁷ that are hard enough to require some careful thought and analysis but can be reasonably completed in one sitting. The cases also require integration of fact and law in a setting in which only a few procedural rules are important and fact-finding is not very formal. Although the lawyer works in an adversarial system, the opponent is a bureaucracy, and at the administrative hearing no representative appears on behalf of that bureaucracy. Therefore, the cases do not generally present issues arising from an adversary's personality or individual style.⁷⁸ In short,

70. One interesting question is whether that solution correlates to any particular kind of lawyering. For example, one might hypothesize that interviewing the client before taking any other action or pursuing other planning activities is more client-centered or client-empowering, on the theory that the lawyer will frame the planning in light of the client's narrative. Alternatively, one might hypothesize that the lawyer who failed to engage in more planning before the client came in could not empathically interview, strategize with, or empower the client as well as the better prepared lawyer. Theoretical arguments may be presented on either side, but longitudinal comparative data would provide the best kind of answer.

71. See Matthew Diller, *Entitlement and Exclusion: The Role of Disability in the Social Welfare System*, 44 UCLA L. REV. 361, 384 (1996) (discussing the social construction of the category of disability).

72. The extensive literature on the program extends from the scholarly, see *id.* at 362 n.1 (collecting cites); to practice manuals, such as CHARLES T. HALL, *SOCIAL SECURITY DISABILITY PRACTICE* (West Publishing 1995), RICHARD RUSKELL, *SOCIAL SECURITY DISABILITY CLAIMS: PRACTICE AND PROCEDURE* (Harrison Co. 1993), and BARBARA SAMUELS, *SOCIAL SECURITY DISABILITY CLAIMS: PRACTICE AND PROCEDURE* (Clark Boardman Callaghan 1994).

73. 42 U.S.C. § 401 (1994).

74. 20 C.F.R. § 404.1500 (1996).

75. Available in the FGB-SSR database on Westlaw, the Federal Register and compiled editions.

76. These are available in many different forms, but one useful collection of law in this area is the multi-volume SOCIAL SECURITY REPORTER published by West.

77. HART & SACKS, *supra* note 7, at 351 ("This is the job of linking up the particular with the general . . .").

78. An adversary would introduce additional factors for analysis, but this would not change the

SSD cases present many of the elements central to the litigation of small cases. In problem solving terms, SSD cases present relatively more structured problems in a relatively smaller problem space than most typical lawyering settings, while still presenting problems of contingency, lack of structure and large problem space that characterize lawyering problems in general.

Although relatively well-structured lawyering problems are typically addressed in a repetitive, high volume practice,⁷⁹ they appear particularly amenable to analysis within the problem solving model. This fit rests upon two interrelated assumptions, both deserving careful critique. First, both the model and many high volume, repetitive lawyering settings value speed. Newell and Simon explicitly chose problems that could be solved in under a half hour.⁸⁰ The second, related assumption is a preference for lawyering goals which permit speedy solving.

The time limit is not intended to reflect an assumption about the amount of care and effort a lawyer is expected to devote to an SSD case. There is some evidence that we tend to problem solve in episodes, and many lawyers think about problems many times over the course of days, weeks or months. This is a study of a single episode, and this Article does not claim that these solvers have definitively solved this case, whatever that might mean. Often, however, a few episodes like this comprise all the focused problem solving that many cases receive in high volume practice settings⁸¹ and this research makes no normative claims about the appropriateness of valuing speed. There are clear dangers to valuing routine over creative solutions and suggesting that the result need only be good enough, or as good as the last case, although the volume of unmet legal needs poses a real pressure on poverty lawyers. This study may provide some help in analyzing speed in lawyerly problem solving. The emphasis on speed also assumes that all solvers work at the same pace,⁸² or at the very least, that speed is not related to the other differences discussed below.

approach of the study, nor I believe, its results.

79. My formative practice experience was in a public defender setting, where specialization and high volume place a premium on efficient use of time. Typical legal service practices involving individual representation, in areas such as housing or public benefits, put similar pressures on lawyers. Much has been written about the effect of large caseloads on lawyering. See, e.g., Richard Klein, *The Relationship of The Court and Defense Counsel: The Impact on Competent Representation and Proposals for Reform*, 29 B.C. L. REV. 531, 532-41 (1988).

80. NEWELL & SIMON, *supra* note 1, at 72. See also *supra* note 45.

81. There are many private practice examples. For example, there are firms that specialize in a combination of social security and worker compensation cases. Other administrative proceedings, such as worker compensation hearings also offer fertile ground for the private practitioner who can organize and manage a large non-lawyer staff and handle a large number of relatively small cases.

82. Newell and Simon explicitly assume little individual variation among solvers. See NEWELL & SIMON, *supra* note 1, at 864-67.

The emphasis on a speedy answer favors those who identified goals that made the problem easier to structure.⁸³ As will be seen below, the traditional, instrumentalist lawyer,⁸⁴ whose goal is to achieve a narrow, legally defined result, looks most like the Newell and Simon solver of a well-structured problem.⁸⁵ But that similarity does not necessarily mean that the instrumentalist lawyer is the best legal problem solver. Ease and speed of solution may have a place in setting lawyering goals, but they are surely not the central measure of good lawyering.

In this project, I have framed the issue of lawyering goals by assuming that the range of goals actually used by the experienced practitioners analyzed in Part III are reasonable and valid. I chose outstanding practitioners, whose work exemplifies "good lawyering." By this I mean the work of caring, hard working and widely respected lawyers who obtain favorable results for their clients. Their solutions to this problem are taken and analyzed as appropriate first steps toward one widely shared conception of "good representation" among a community of practitioners.⁸⁶

C. Collection and Analysis of the Protocols

The most common kind of human problem solving research involves tape recording subjects as they verbalize an episode of problem solving, providing "concurrent verbal protocols."⁸⁷ For this research, ten subjects were recorded. Three were lawyers with practice backgrounds in legal services settings who focused on SSD cases. One was a law professor, experienced in appellate and trial level criminal law.⁸⁸ The remaining six were law students, three of whom

83. Two goals consistent with a better structured version of the problem have already been identified. First, the goal of generating a specific set of tasks presents a better structured problem because there are relatively fewer closed constraints. Second, the goal of identifying possible case theories can be viewed as a planning exercise in a more abstract space with fewer open constraints.

84. See Alfieri, *supra* note 67, at 2619.

85. See generally NEWELL & SIMON, *supra* note 1.

86. I do not claim this small sample captures all the lawyering goals of "good" lawyers, but as will be seen below, it captures an important pair. See *infra*, Part IV.C., for a discussion of further research to explore this assumption.

87. This technique is used by clinical law researchers in other settings. It is really a particular version of transcript analysis. For examples of research using various kinds of transcript analysis, see *supra* note 19. In this research the data is used to analyze cognitive processes. Another method, retrospective protocol collection, involves having subjects report on their thinking after a solving episode. It is useful for collecting evidence on the subject's reflections on their processes. See ERICSSON & SIMON, *supra* note 46, at 16. Cognitive science, with its commitment to mental representations and replicability of results in computer simulation, has been much concerned with the claim that these verbal reports offer information about real cognitive processes. Empirical data supports the view that these reports are not epiphenomenal and do not alter the cognitive process itself. See *id.* at 67-107.

88. That subject is a subexpert, see *infra* note 115, who is an expert in a related domain but lacks specific knowledge in the domain under examination.

took a class which involved simulation of an SSD case from initial interview to appellate brief, and three of whom represented an SSD claimant in a live client clinic.

The subjects were tape recorded as they spoke aloud while working through the problem.⁸⁹ The tape recordings were transcribed to produce the written protocols discussed in Part III.⁹⁰ Those written protocols were then divided into units of analysis or "segments,"⁹¹ and consistently labeled or "encoded,"⁹² to permit testing of the previously identified hypotheses regarding the differences between inexperienced and experienced legal

89. I collected some of the protocols and a research assistant collected others. Each protocol collection session began by starting the tape recorder and then having the researcher read an instruction sheet to the subject, telling him or her that he or she would be given a simulated case file and asked to "think aloud" about the case. The researcher then offered an example of "thinking aloud" while solving a multiplication problem in which he or she continuously verbalized each mental step while doing the math problem on a piece of paper. The importance of continuous verbalization was stressed to each subject and the only prompt each researcher used during the data collection was to say "please keep talking" to any subject who fell silent. The subject was then handed a twelve page simulated case file, consisting of a one page typed form labeled "intake form," forms from the Social Security Agency denying the claim administratively, and a one page medical report from a physician. The subjects were told that the claimant had brought all the documents to the interview, except the intake form, and that a paralegal had interviewed the claimant and filled out that form. As the subjects were given the case file, they were asked the question, "What would you do if you represented this claimant?" The question posed put the subjects in the role of advocate, but left the conceptualization of that role undefined. The subjects were then tape recorded as they thought aloud.

This simulated case is closely based on a problem developed by Professor Nancy Morawetz for a class in Social Welfare Policy at New York University School of Law. Only a few details of the problem were altered for this research. One of the experienced lawyers commented on how typical the case, and the case file, were in his practice.

I collected protocols from three experienced solvers, two of whom were "law solvers" and two inexperienced solvers, one of whom was a "law solver" and the other a "fact solver." A research assistant collected data from the five other inexperienced solvers and three of the solvers turned out to be "fact solvers," while the other two were "law solvers." See *infra*, Part III.C., describing the differences between "fact" and "law" solvers.

90. The pioneers in the use of this method labeled it observational and non-experimental, see NEWELL & SIMON, *supra* note 1, at 12. They also discussed the difficulties of testing theories of dynamic, history-dependent systems in their discussion of the absence of statistical verification from their work. See *id.* at 123. Those difficulties are practical, not theoretical. Statistically valid problem solving studies using verbal protocols have been done. Newell and Simon's view of proof is more like a lawyer's than a social scientist. They look to persuade with examples and analysis, rather than statistics. For an example of legal scholarship that uses, and convincingly defends, in depth analysis of a single subject, see Gregory Matoesian, *Policy Implications of the Kennedy Smith Rape Trial*, 29 L. & SOC'Y REV. 669, 678 n.5 (1995).

91. Each segment captures a discrete idea. See ERICSSON & SIMON, *supra* note 46, at 266-73, 287-91. For a discussion of efforts to account for the variability of segmentation, see *infra* note 188.

92. Encoding refers to the systematic and reproducible categorization of the segments of the protocol, according to the theory advanced. ERICSSON & SIMON, *supra* note 46 at 279-87. In this research, two coders, the author and a research assistant, independently classified segments as either law or fact statements. Analysis of those results is used to support the hypothesis that solvers work in either fact or law spaces. See *infra* notes 185-89, and accompanying text.

thinkers, and between those who analyze in factual terms and those who use legal terms.

One problem posed by protocol analysis is the need to avoid ad hoc theory development to explain bits of data as they are analyzed. My own lawyering experience enabled me to develop hypotheses about lawyering by analyzing the problem before the data was analyzed.⁹³ This type of problem analysis is formally called "task analysis," the subject of the next section.

D. Task Analysis of the Initial Case Assessment of Mr. Sims' SSD Case

Problem solving research begins with "task analysis,"⁹⁴ the technical problem solving term for the process of identifying the most promising solving strategies for the problem at hand.⁹⁵ Lawyers engage in non-technical task analysis whenever they consider how the details of a new situation inform their initial approach to the problem it presents. What follows is a very general task analysis of this study's simulated case, highlighting a few aspects that play a large role in performing an initial assessment.⁹⁶

This study's simulated case involves Benjamin Sims, a fifty-four year old man, who worked from the age of sixteen until his right hand and arm were

93. Typically, this is quite problematic for the investigator who is an expert in cognitive science, but not the substantive domain under investigation. I have the benefits and problems of the reverse situation, having expertise in the law, but not cognitive science. My experience as a lawyer made greater independence of theory generation and data analysis possible, and the decision to limit my encoding of the protocols to identification of fact and law statements is the flip side of my particular expertise in lawyering, rather than problem solving research. The alternative, developing theories as the data is analyzed, is characteristic of analysis of protocols of tasks that are new to the cognitive science researcher. Developing theory as data is analyzed can be a valid method of hypothesis generation, but requires much greater care in data analysis. See ERICSSON & SIMON, *supra* note 46, at 283.

For a discussion of a methodological orientation that does not separate theory generation and data analysis, see Gelhorn et al., *supra* note 19, at 251 (noting that anthropological research is not structured to test preconceived hypotheses, unlike other sorts of social science research).

94. A summary of Newell and Simon's task analysis of the "DONALD + GERALD = ROBERT" cryptarithmic problem is discussed in Part II. See *supra* notes 49-54. Task analysis identifies the problem spaces and task formulations in which particular problem solving methods can be applied. It involves identification of features of the problem and the solver's total knowledge, which provide the clues or possible heuristics which make solving possible, and then infers the symbols and operations that would operationalize those heuristics.

95. The researcher's hypotheses about how solvers will approach the problem should be developed during the task analysis phase of the research so that those hypotheses are set before analysis protocols begins. Otherwise one is at risk of ad hoc theory development, as discussed above, see *supra* note 93.

96. I have stressed the methodological importance of task analysis; the following discussion is a very nuts and bolts, practice-oriented description of SSD. If the reader is familiar with the area, this section might be read after the protocols, and the reader might compare his or her task analysis with mine. If the reader is unfamiliar with the area and is willing to accept the problem solving model, for at least the moment, this section provides some domain-specific knowledge necessary to analyze problem solving in this area.

injured in a car accident five years ago. The agency denied his application for SSD and he has requested a hearing before an Administrative Law Judge (ALJ). This simulation presents the file generated at the legal services office where he has sought representation for the hearing.

1. Substantive Standards for a Finding of Disability

SSD cases are adjudicated in a multi-step administrative process, governed by detailed rulings and regulations.⁹⁷ The key question in the vast majority of SSD cases is whether the claimant meets one of the legal standards for disability under the regulations which operationally define the statutory standard.⁹⁸ SSD claimants who are found to have medical conditions meeting listed diagnostic and clinical criteria are presumptively disabled. These claimants "meet or equal a listing."⁹⁹

If the claimant's condition does not meet or equal a listing, his or her advocate must show that the impairments limit residual functional capacity (RFC), to such a degree that he or she cannot work.¹⁰⁰ RFC determinations are made in two ways. The first involves presumptive rules based upon an individual's age, education, job skills and functional ability to sit, stand, lift, walk, carry and bend, set out in the regulations in charts known as the "grids."¹⁰¹ In addition to the generally applicable grids, there is also a special

97. See *supra* notes 72-75.

98. A person must be unable "to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment." 42 U.S.C. § 423(d)(1)(A) (1994).

99. Listing of Impairments, 20 C.F.R. § 404.1525 and § 404, subpt. P, app. 1 (1996); Medical Equivalence, 20 C.F.R. § 404.1526. In this case, Mr. Sims is described in a report as having crushed his right hand in a car accident approximately five years earlier, and sustaining injuries to his back and right arm. Although Mr. Sims has some back pain, he does not appear to meet the nearest applicable listing. See Other Vertebrogenic Disorders, 20 C.F.R. § 404, subpt. P, app. 1, 1.05(c) (specifying the objective medical evidence which would qualify the claimant for a presumptive finding of disability). The other possible area for what is colloquially known as a "listing argument" would be the damage to his right hand; the listings, however, require amputation of a hand or loss of both hands (or both feet) for a finding of presumptively disabled. See *id.* § 404, subpt. P, app. 1, 1.09. Although additional facts need to be developed, this does not appear as a likely "listings" case.

100. The statute specifies that a person must "not only [be] unable to do his previous work but [must be unable], considering his age, education, and work experience, [to] engage in any other kind of substantial gainful work which exists in the national economy.." 42 U.S.C. § 423(d)(2)(A) (1994). The regulations specify how the determination is to be made. See 20 C.F.R. §§ 404.1520, 404.1545-1569, 404, subpt. P, app. 2 (1996).

101. The grids are another set of presumptive rules. Given a claimant of a certain age, vocational background, education and exertionally limited Residual Functional Capacity, the grids tell a decision maker whether or not there is substantial gainful employment for that person in the national economy. The tables known as the grids are set out in 20 C.F.R. § 404, subpt. P, app. 2 (1996). See also *Heckler v. Campbell*, 461 U.S. 458 (1983) (holding that the agency acted within its authority in promulgating the grids). There are three sets of grids, reflecting determinations for people capable of medium, light and sedentary work. Anyone who can perform heavy work will not qualify under the grids. See 20 C.F.R. §

rule for people who have performed heavy work for thirty-five years or more—the “arduous work rule.”¹⁰² This rule reflects the judgment that people who have performed only physical labor all their work-lives are unlikely to be suited to other kinds of jobs.

A claimant who does not qualify on the grids may still qualify as disabled by showing that other functional limitations beyond sitting, standing, lifting, walking, carrying and bending prevent him or her from working. If, for instance, the claimant’s back pain were so severe that he or she could not concentrate sufficiently to work, that person might be found disabled on an “off the grids” analysis.¹⁰³

2. Proof Issues

Every SSD determination in a represented case¹⁰⁴ involves the presentation of technical medical evidence by lawyers to an ALJ. The evaluation of the medical evidence often turns on two legal requirements. First, the regulations require “objective signs and symptoms”¹⁰⁵ and direct ALJ’s to credit certain testimony if it is supported by such evidence. Second, the regulations require that the opinion of a “treating physician”¹⁰⁶ be given “controlling weight”¹⁰⁷ if certain conditions are met. Thus, if a claimant has an ongoing relationship with a doctor, and that doctor will sign an attorney drafted affidavit which states that the doctor has performed appropriate tests and his or her medical opinion is that the claimant has a particular condition

404, subpt. P, app. 2. Only the oldest claimants capable of medium work will be found disabled, but progressively younger claimants will be found disabled if they are limited to light and sedentary work. *See id.*

Mr. Sims is 54, did not graduate from high school, has a long history of work involving heavy lifting and has no transferable skills. *See* 20 C.F.R. § 404.1568(d) (1996) (defining transferable skills). The grids dictate that Mr. Sims would be found disabled if he was limited to sedentary work, *see* 20 C.F.R. § 404, subpt. P, app. 2, 101.10, but his limitations are not yet clear and this argument will require factual development.

102. 20 C.F.R. § 404.1562 (1996).

103. *See* 20 C.F.R. § 404.1569(a) (1996). The evaluation of these factors is sequential. *See* 20 C.F.R. § 404.1520. The five step sequential evaluation requires that the claimant: (1) not be engaged in substantial gainful employment; (2) suffer from a severe, medically determinable illness expected to last for 12 months or result in death; (3) meet or equal the listing of impairments; or (4) be unable to return to past relevant work; and (5) be unable to perform other work available in the national economy. Failure to meet steps 1 or 2 ends the analysis and failure to meet step 3 requires analysis at steps 4 and 5.

104. Most claimants are *pro se*. They operate in the same environment, and study of their problem solving would provide another set of contrasts and insights.

105. 42 U.S.C. § 423(d)(5)(A) (1994) (requiring “medical signs and findings, established by medically acceptable clinical or laboratory diagnostic techniques”); 20 C.F.R. § 404.1512 (b)(1) (1996) (requiring evidence of the impairment).

106. *See* 20 C.F.R. § 404.1527(d)(2) (1996).

107. *Id.*

or a set of required exertional limitations, the claimant will have a strong argument at the hearing and a non-frivolous appeal.¹⁰⁸

Those legal rules permit a solving strategy typically used to "reduce the size of the problem space"¹⁰⁹ or simplify solving in SSD cases. The ALJ's factual determinations about treating physicians' medical evidence are more constrained than other factual determinations¹¹⁰ because these rules permit advocates to convert factual issues into legal issues. The lawyer can argue that the ALJ has a legal duty to give certain facts controlling weight.¹¹¹ In problem solving terms, this strategy organizes this ill-structured problem by converting a large set of open constraints, all the possible factual inferences, into a smaller set of open constraints involving the application of legal rules. This strategy provides some additional structure, but does not make the whole problem well-structured.¹¹²

One other significant feature is that these hearings are non-adversarial. The Social Security Agency is not directly represented in the hearing. The Agency's interests are protected by the ambiguous role of the ALJ, who is a neutral fact finder, charged with developing the entire record and safeguarding the agency's position.¹¹³ In reality, the judge's position can range from quite adversarial to the claimant to strong advocacy for the claimant. That position will vary with the case and the temperament of the judge. The advocate usually learns the identity of the ALJ who will hear the case no later than three weeks prior to the hearing.

108. That is not to imply, in any fashion, that doctors or lawyers are engaged in any improper conduct. It is clearly the lawyer's job to investigate and collect relevant proof and the doctor's role to explain medical facts to the court.

109. See NEWELL & SIMON, *supra* note 1, at 108-09.

110. The ALJ's factual determinations are reviewed on the very deferential "substantial evidence" standard of 42 U.S.C. § 405(g) (1994). Substantial evidence is "more than a mere scintilla. It means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Richardson v. Perales*, 402 U.S. 389, 401 (1971) (quoting *Consolidated Edison Co. v. N.L.R.B.*, 305 U.S. 197, 229 (1938)). The treating physician regulation, however, imposes particular standards for the evaluation of treating physician evidence, in effect imposing a less deferential standard of review on appellate review of the ALJ's factual determinations in that area.

111. Significant issues remain about what particular statement the doctor will sign, how the doctor's opinion will fit with all the rest of the evidence, whether the ALJ will find that the doctor is a treating physician, and many other open constraints.

112. Strategies that begin by using proof issues and other legal rules to reduce the size of the problem space also reduce the facts, as well as the client, to an abstract constant. That strategy can result in a preliminary case theory with very little factual knowledge of the case, but it does not address any other aspects of Mr. Sims' situation. There are particular costs and benefits to using a given goal to organize an ill-structured problem. This problem presents more structure if seen as an exercise in case theory. The problem becomes less structured, and presents less relevant information, if seen as a problem in helping this client deal with his medical problem by getting treatment, disability payments, and other kinds of support.

113. See 20 C.F.R. § 404.944 (1996).

III. PROTOCOLS OF PROBLEM SOLVERS

A. *Differences Between Experienced and Inexperienced Solvers*¹¹⁴

This section shows how experienced solvers use one set of cognitive processes to move rapidly and accurately¹¹⁵ through the problem space, while inexperienced solvers must use other methods to move through the space hesitantly. The experienced thinkers see deeper patterns, reason more rapidly, identify more powerful goals, use a smaller subset of information more efficiently and have more accurate recall than inexperienced thinkers. Inexperienced thinkers attend more to surface features, reason more slowly and incompletely, identify less useful goals, express the need to gather more information before coming to any conclusion and suffer from less accurate recall and less precise reasoning.

Identification of the different solving styles of experienced and inexperienced thinkers was the most important theoretical change in the problem solving model after the publication of *Human Problem Solving* in 1972.¹¹⁶ Although Newell and Simon stressed the importance of content in their early work, they sought general, powerful methods that would solve any kind of problem.¹¹⁷ As that effort did not bear fruit, Simon moved away from the search for a general problem solver¹¹⁸ and began to look at the consistent performance differences in the respective problem solving processes of so-called "novices and experts."¹¹⁹ Experts are able to solve problems in their

114. Legal Solvers 2, 3, 4 and 5 are the inexperienced solvers. They were law students at the time of the study. Solvers 1, 6 and 7 are the experienced solvers. I have used the terms "experienced" and "inexperienced," rather than "novice" and "expert," because the latter distinction is best used to denote exceptional performance, while the former pair captures the difference in cognitive processes between those with lesser or greater experience without taking any view on whether the experienced solvers are exceptional among the group of experienced solvers. Exploring the difference between lawyers who "forward reason" to the same conclusion in every case, and those who use experienced thinking to arrive at exceptional answers would be an important project.

115. This brackets the important question of choosing and evaluating goals. See *infra* Part IV.B.

116. See NEWELL & SIMON, *supra* note 1.

117. But empirical observations of both humans and machines did not bear out that hope. The early search-based computer systems were simply not powerful problem solvers. They became more powerful as knowledge was added, not as better search techniques were found. See EDWARD FEIGENBAUM, *What Hath Simon Wrought?*, in COMPLEX INFORMATION PROCESSING: THE IMPACT OF HERBERT A. SIMON 172 (David Klahr & Kenneth Kotovsky eds., 1989).

118. See William G. Chase & Herbert A. Simon, *Skill in Chess*, 61 AM. SCIENTIST 394 (1973).

119. Between novices and experts are subexperts, who have generic knowledge but inadequate specialized domain knowledge (often experts in a related field) and intermediates, who know more than novices but less than subexperts. See VILNA PATEL & GUY GROEN, *The General and Specific Nature of Medical Expertise: A Critical Look*, in GENERAL THEORY OF EXPERTISE, *supra* note 12.

area of knowledge, or domain, much faster, more accurately and with much less conscious cognitive effort than novices.¹²⁰

The movement toward understanding expertise provides the key to the cognitive door of problem solving. The expert knows more about his or her area of expertise *and* uses different cognitive processes when reasoning in that area,¹²¹ as the protocols illustrate. The novice/expert distinction has important implications that reach beyond professional acumen; the cognitive processes that typify expertise are pervasive. We are all experts in a host of everyday domains.¹²²

1. The Application of a Domain-specific Model

From the start, the experienced and inexperienced solvers did different things with the information presented to them. While the inexperienced solvers attended to the information in the order presented in the file, each experienced thinker verbalized his or her attention to particular bits of information in a different sequence. It is as if each experienced solver has his or her own previously developed template, or form, and attends to information in the order it is called for in their mental checklist, not in the order presented. In problem solving terms, the experienced solvers are using individually developed "domain-specific models." From the outset they used their models to identify and relate bits of relevant information.

120. The observed differences reflect the quantity and organization of domain-specific knowledge and show problem solving to be even more content sensitive than Newell and Simon first hypothesized. Chi and Glaser note seven characteristics common to expert thinking: (1) Experts excel mainly in their own domains; (2) Experts perceive large meaningful patterns in their domain; (3) Experts are fast and solve problems with little error; (4) Experts have superior short term and long term memory; (5) Experts see and represent a problem in their domain at a deeper (more principled) level than novices; (6) Experts spend a great deal of time analyzing a problem qualitatively; and (7) Experts have strong self-monitoring skills. Experts seem to be more aware than novices of when they make errors, when they fail to comprehend and when they need to check their solutions. See ROBERT GLASER & MICHELENE CHI, *Overview, in THE NATURE OF EXPERTISE*, *supra* note 14, at xvii-xx; see also KEITH J. HOLYOAK, *Symbolic Connectionism: Toward Third Generation Theories of Expertise, in GENERAL THEORY OF EXPERTISE*, *supra* note 12. Professor Blasi offers a detailed and insightful discussion of expertise. See Blasi, *What Lawyers Know*, *supra* note 20, at 343-48.

121. For example, expertise is characterized by the ability to recognize the applicable rule and apply it directly (referred to as the process of forward reasoning) rather than identifying goals and reasoning backward from those goals to identify the rule. See Amsterdam, *21st Century Perspective*, *supra* note 20, at 614 (describing ends-means or backwards reasoning). See *infra* Part III.A.2. for examples and discussion.

122. Problem solving is a central and very common human activity and all problem solving is a search in a problem space, typically using strong, domain-specific search methods emphasizing schema and models. See Winter, *The Cognitive Dimension*, *supra* note 7, at 2233.

For example, one experienced solver¹²³ verbalized the information out of the sequence presented by the file to attend first to age, then education, then work history as an indicator first of job skills, and then to learn the level of the prior work.¹²⁴ From the start, this experienced solver organizes this basic information according to a deeper, idiosyncratic pattern, building a schematic of this claimant structured by the substantive legal rules governing eligibility. In problem solving terms, his path reflects the task environment. His claimant schematic reflects the grids, a set of key eligibility criteria. He wants to know age, educational level, and skill level first because his model is informed by the fact that they are an important and often the dispositive triplet in SSD cases.¹²⁵ In practical terms, he attends to these factors first because a case involving a young, educated and skilled person will likely require a different approach from a case involving an older, less educated and unskilled person.

In contrast, the inexperienced solvers read through the problem and verbalized their attention to relevant legal issues and problems with the evidence in the order in which it was presented on the forms. For example, one inexperienced solver sorted the facts into legal categories, such as "heavy work" and "the above 49 category," as they came along. There was no evidence that she related the legal ideas to each other to develop a theory of eligibility.¹²⁶ Unlike the experienced thinker, she immediately related those ideas to each other. The difference between the two is not just in what they know, but also in what they do with what they know.

2. Forward and Backward Reasoning

After applying a schematic to sort the facts, the experienced solver displayed the hallmark of experienced thinking in his automatic (and apparently unconscious) application of a rule. This is known as "forward reasoning," or "forward application" of a rule, in which the solver works from the given information, to the unknown, without intermediate steps. It is

123. This discussion of the protocols only offers an illustrative summary of a more detailed analysis of the protocols which I have on file. I have taken pieces from each protocol as they most clearly illustrate a given point and have tried to note the range of variation among the solvers, but I do not offer this discussion as a complete analysis marshaling all the evidence to prove any of these observations. Earlier drafts of this work convinced me that even a reasonably readable complete argument for these points was beyond the scope of any version of this article I might write.

124. Solver 1, Segments 7-11 (complete transcripts for all solvers on file with author).

125. Another experienced solver organized differently, first attending to work level as a function of step four past relevant work analysis, and then attending to the age, education and skill level triplet when referring to the grid. The differences among the experienced solvers offer insights into the models each has developed, and could be fruitfully studied to shed light on those models. Unfortunately, that level of detail is beyond the scope of this research.

126. For example, *see* Solver 3, Segments 11-19.

usually contrasted with “backward reasoning,” in which the solver identifies goals and then formulates different hypotheses to relate the goals to the known information, working “back” from the goals to find a relationship that fits the known information.¹²⁷

The following passage is an example of forward reasoning in which the experienced solver identifies and applies a rule that gives special status to SSD claimants who have worked for thirty-five years or more in physically demanding settings which qualify as “heavy work.” The rule is known as the “arduous work rule.” Solver 1 said:

His other jobs were basically also heavy work. Manual labor. But they're really not that important, because they're outside the fifteen year limitation for—past relevant work. But. It says from 1958—yeah, 1958 through 1991, a period of—thirty-three years? Which is almost enough for the—I forget the name of the case. But there's a Second Circuit case which says that if you work—very hard labor for over thirty-five years, and you allege disability, that you can't do that work any more. That's—that's compelling testimony, based upon past relevant work. So, that's important. We want to develop that as—for the hearing. And do the research and get the case—case law on that.¹²⁸

The solver very rapidly¹²⁹ identifies the rule and applies it. In this example of forward application, there is no verbalization of any separate step of logical operations to apply the rule, such as “if . . . then,” nor does the solver break the problem into smaller units for resolution. There is a rapidity, often characterized as “automaticity.”¹³⁰ By way of contrast, the solver needs to calculate the period of years involved, using a non-automatic operation, evinced by his verbalizing the year, saying “. . . a period . . .” and hesitating to do the calculating. By the time he says “1958—yeah,” however, he has

127. Forward reasoning is a “strong” domain-specific strategy that came to the forefront of problem solving research when the limitations of “weak,” search-oriented, general methods became apparent. See NEWELL & SIMON, *supra* note 1, at 835-39; PATEL & GROEN, *supra* note 119, at 93-126 (discussing forward reasoning in medical diagnosis).

128. Solver 1, Segments 15-17.

129. The speed of the solving, an important variable in this study, is reflected in several ways in the protocol excerpts. Speed is often captured by the number of words each solver uses to move from one idea to another. Each solver was instructed to talk continuously as he or she solved, so the volume of the protocol, as well as the segment count, *see supra* note 89, devoted to any portion of the solving offers an indication of the speed of the solving in that area. Another indication of speed is the number of cognitive steps, or “productions,” *see infra* note 136, a given solver uses to analyze a particular issue. Solving speed can also be reflected by immediate movement from one issue to another, without any evidence of intervening reasoning.

130. LAKOFF, *supra* note 59, at 227-32 (discussing automaticity).

already brought the relevant rule into short term memory and recognized its application.

This example of forward reasoning may be best appreciated by contrasting it with a less experienced solver's backward, or end-means reasoning,¹³¹ to identify and apply the same rule. The inexperienced solver begins by using the language of the denial notice to identify the goal from which he will reason backwards.¹³² He says:

So—I guess the thing that needs to be done now is research into what the government—to what they decide—what kinds of jobs that Mr. Sims can do. Let's see if there is something in the "regs" that talk about being able to work.¹³³

In this passage, this less experienced solver identifies his goal, "finding something in the 'regs'" that addresses the issue of ability to work. First, note the very simple, general and uninformative goal of finding "something in the 'regs' that talk about being able to work." That goal is only useful in a very weak, general search method—looking at all the regulations and applying the general criteria of sorting out those that address ability to work. Having first explicitly identified the goal, this solver now works back from there. In the language of the problem solving model, this is a classic example of an inexperienced problem solver using a weak, general search method in a much less focused search through a large problem space consisting of all the regulations. It should be noted, however, that this strategy does work for him and he finds the "arduous work rule."

So far we have compared the experienced thinker's rapid identification and application of the rule with the inexperienced solver's explicit goal setting. The inexperienced solver goes on to find and apply the rule, saying:

If you only have minor education—he does—long work experience—i.e. thirty-five years or more—he—does, where you only did arduous, unskilled physical labor—he did—can no longer do this kind of work, we'll use a different rule. Oh. 4041562. I'm now going to look at 4041562. Here it is. If you have only a marginal education and work experience of thirty-five years or more during which you did arduous, unskilled, physical labor, and you are not working and you are no longer able to do this kind of work because of a severe impairment, we will consider you unable to do lighter work—and if you are working or have worked despite

131. See Amsterdam, *21st Century Perspective*, *supra* note 20, at 614.

132. The explicit identification of the goal sets a context and structures this episode.

133. Solver 4, Segments 58-59.

your—okay, he's not—we will not—consider that you are not disabled if the evidence shows that you have training, or past work experience, which enables you to do substantial, gainful activity in another occupation with your impairment, either on a full-time, or reasonably regular part-time basis. And they give an example. B is a sixty year old miner with a long—with a fourth grade education—who had a life-long history of arduous physical labor. Disabled because of arthritis of the spine, et cetera. Medical evidence shows that a come—he cannot do this type of work. Vocational background does not show that he has skill capabilities needed to do lighter work. B is disabled. Okay. Based on that example, and based on my initial impression of his employment, I can't imagine that he's trained to do anything besides heavy lifting.¹³⁴

This goal, finding something in the regulations that explains how the Agency evaluates whether or not the claimant can work, is much less discriminating than the experienced solver's goal of evaluating whether the prior work is relevant to any rule besides "past relevant work."¹³⁵ Once he identifies the particular rule as potentially applicable, application requires that he understand the rule. He does that in steps reflecting operations involving syllogistic reasoning. He uses the "if . . . then" structure of the rule and the example to identify the possible applicability of the rule, and then concludes that it does apply to this situation.

Although some may jump to the conclusion that all this example demonstrates is that the experienced solver knows or remembers the rule, that does not explain how he is able to do something powerful and rapidly apply it. Nor does it offer any insight into how the experienced solver makes the association some would label mere "remembering," a mental act more fairly associated with the passive act of recall than the subsequent active use of the recalled idea. Unless our common ideas of what it means to know or remember are stretched beyond their usual boundaries, the difference between the two solvers cannot be explained by just saying that the experienced thinker knows or remembers more. This is because the inexperienced thinker comes to know the rule in the ordinary sense when he reads it in the regulation, but he still cannot do the same thing that the experienced thinker does with that bit of knowledge.

Closer analysis of the protocols illustrates the difference. The experienced solver's protocol reveals that his identification of the "arduous

134. Solver 4, Segments 68-73.

135. These two goals offer clear examples of a simple goal and a mixed substance procedure goal that carries information about the test in the knowledge state.

work rule" took place over four different "productions."¹³⁶ The evidence for the two most interesting moments ("productions") in the reasoning, those in which the solver apparently recognizes the applicability of the rule when he says, "but," and when he says, "yeah" is thin,¹³⁷ but we can infer some things from the context.¹³⁸ The first production in the sequence, deciding that the earlier work was not relevant, involved some test of the prior work against rules for which it would be relevant. Although the "prior relevant work rule" was rejected, this solver remembered the "arduous work rule" (brought it into short term memory) through an automatic and non-obvious set of associations. There is no obvious or logical connection between the two thoughts that would permit someone lacking a cognitive model to make the association. In comparison, the less experienced solver used an obvious, but slow, method—he scanned all the regulations. Whatever the structure of the particular associations, they permit the experienced solver to very rapidly "remember" or find one rule from among many possibilities. Even if we gave the inexperienced solver the opportunity to "remember" the rule by presenting it to him in written form, he would still need to go through the distinct process of figuring out whether it could apply to this case and, if it could, how it in fact does apply. Saying the experienced thinker simply knows or remembers that the rule applies from experience requires the creation of two kinds of knowing. First, the knowing that comes before experience, and second, a different kind of unconscious and unarticulated knowing that comes with experience and permits this second kind of knower to do something new and different. If he "knows" it from some automatic and unreflected-upon process, we should certainly be very interested in unpacking and understanding that process, rather than stretching our idea of what it means to know a piece of information to make that process invisible.

The next step in this sequence, in which the experienced solver says "yeah"¹³⁹ is the application of the rule to this case. As soon as the calculation is completed and before he verbalizes the end of the calculation, the experienced solver has decided that the rule applies to this case. The striking difference between the way these two solvers find and apply the "arduous work rule"—the difference between "yeah" and the inexperienced solver's

136. "Production," is a technical term for Newell and Simon, which refers to the relevant level of cognitive analysis. A production is the individual cognitive unit which moves the mind from one present state of awareness to the next. We may dwell on a particular state and verbalize many words, or move swiftly from one to the other only verbalizing a hint. See NEWELL & SIMON, *supra* note 1, at 33, 259-60.

137. Those two words, "but" and "yeah" are each productions. Although they provide sparse evidence for analysis, they are the correct unit of analysis.

138. See ERICSSON & SIMON, *supra* note 46, at 266-73, 287-91 (discussing units of analysis and use of contextual cues).

139. See *supra* notes 136-38 on the choice of this unit of analysis.

lengthy process of application—shows that forward reasoning and backward reasoning are not just faster and slower versions of the same processes, but essentially different cognitive processes where both knowledge and experience are required before a solver can develop the ability to forward reason in a given area. Inexperienced solvers cannot simply choose to forward reason and will very rarely do so upon being first presented with a new rule. Epistemological speculation aside, the practical point is that forward thinking involves a different cognitive process and requires an internal, personal insight by the solver. Forward thinking cannot be taught directly by illustration or explanation. Only with experience do inexperienced solvers structure their knowledge (develop cognitive models) and come to engage in rapid rule application.¹⁴⁰

This analysis of forward reasoning should not obscure the fact that this inexperienced thinker did find and apply a rule that may be dispositive. This is an important advance over other inexperienced thinkers who did not use the general method of backward reasoning to compensate for their lack of substantive domain-specific knowledge. Although the two solvers analyzed in this section offer a contrast in method, the more fundamental lawyering point may really be that both reach the same useful and important conclusion about the case despite the difference in method. Given the subdomain-specificity of forward reasoning and the very individual way it develops for each person, it may well be that law professors need to focus more on teaching backward reasoning¹⁴¹ while they set up the conditions under which their students can develop forward reasoning for themselves. After all, every lawyer, particularly newer lawyers, must deal with legal problems outside his or her area of expertise.

3. Setting Goals to Use Information Efficiently

Experienced solvers require relatively less information to reach a conclusion than inexperienced solvers.¹⁴² For example, in the experienced

140. In Lakoff's terms, forward reasoning uses an "embodied cognitive model" and contrasts the automaticity that comes with embodiment with the conscious and notable effort required for an unembodied model. LAKOFF, *supra* note 59, at 13. The image of embodiment captures the same idea as Newell and Simon's information processing language describing goals that contain more or less information within their own structure. Those goals embody more information.

141. See Amsterdam, *21st Century Perspective*, *supra* note 20, at 614.

142. "[Experienced solvers] reached conclusions about the case, after reading only three or four cards out of the seven. Furthermore, managers used their experience rather than additional case information to interpret quite heavily from the presented information. What is surprising is that the managers did all of these things with the full knowledge that complete information was available at no extra cost." Isenberg, *supra* note 12, at 784 (labeling this "opportunistic thinking" and contrasting it with Simon's notion of satisfying; the former involves limiting searches even when there are no search costs, the latter balances

solver's verbalization of the medical history, he selects only a subset of the relatively small amount of information presented.¹⁴³ The medical history section is processed through a proof model that evaluates the likely strength of each fact. The kind and length of medical treatment are deemed "significant" in the sense that the ALJ¹⁴⁴ will regard the course of treatment as evidence of the severity of the injuries. As he reads along, the back injury is ignored, perhaps because as a type of case, back injuries pose their own particular difficulties.¹⁴⁵ A crushed hand, however, presents a less common and potentially more compelling claim.

The experienced solver goes on to discuss proof issues related to the medical evidence:

We want to—look for—x-rays here. To—bear out his—subjective complaints. We really need to get—he's treated by Dr. Franklin (PH), an orthopedist, for one—once a year, for the past three years. That can be problematic. However, we need to get the state—it appears that the doctor may be able to write this statement saying that there is no further treatment which can improve his condition. We probably want to get the physical therapy records, in the—post—'91, '92, to find out what exactly was done, and whether or not he exhausted all his—physical therapy. That's gonna be critical. They're gonna—Social Security's gonna jump on the lack of—current medical treatment for this problem.¹⁴⁶

The consideration of the medical evidence is largely in anticipation of how the ALJ will evaluate this case and how to shape that evaluation.¹⁴⁷ This is all the data on which the experienced solver reaches his tentative evaluation that evidence indicating that the crushed hand will not improve with further treatment is key to the case.

searches with costs).

143. See Solver 1, Segments 21-25.

144. 20 C.F.R. § 404.1512(b)(2) (1996).

145. Those difficulties are typically problems of proof. Many people suffer significant pain from so called soft tissue injuries which do not present objective findings. Those cases often turn on claimant credibility, leaving much more up to the judge than objective medical evidence.

146. Solver 1, Segments 26-30.

147. The lack of ongoing care, which may suggest a lack of continuing functional limitations to the ALJ at the hearing, may be explained in a doctor's statement consistent with the intake form notation that "no further recovery is expected." The two sections just discussed provide more evidence that this solver's model gives an important role to knowledge about proof issues, particularly how the ALJ may evaluate facts at the hearing. This experienced thinker offers repeated examples of integrated procedural knowledge, knowing a rule, and how to apply it.

The experienced solver's evaluation, based on very little information, can be contrasted with an inexperienced solver's conclusion that more information is necessary. Solver 3 says:

What would I do about this? Okay. Well, the first thing I'd have to do is find out, I think that this information that you gave me is greatly lacking in medical records. And the first thing I would need to do is find out who this doctor is. If he's a Social Security doctor or if he's a treating physician. I'd obviously, oh, it says, he says he has three surgeries in four months. I have no records of the surgeries . . . So what I really need to do is—really—really do a lot of research into this, into his medical problems.¹⁴⁸

The obvious explanation for this difference is that the experienced solver knows what is important, while the inexperienced solver does not. The experienced solver can be confident that only some facts will be needed, while the inexperienced solver lacks that confidence, and needs to know everything to see how it will all work out. In spite of this, how does the experienced solver move through the problem space with so little information, and is there a downside to it?

The experienced solver uses only a subset of the already small set of facts in the problem. He is able to do this for at least two reasons. First, structured knowledge permits experienced solvers to do more with each individual piece of information, so they need less information overall. Research shows that experts attend to less information and reach conclusions after considering fewer factors than less experienced solvers,¹⁴⁹ but experienced solvers spend more time attending to a given item and will often reach more conclusions from a given piece of information. Experienced solvers plug new information into their already developed model and spend time processing the new information to wring out all its value. For the experienced solver, the new information can mean more. This is another view into the experienced solver's individualistic, or idiosyncratic, solving.¹⁵⁰

Second, and more generally, an experienced solver searches a smaller problem space.¹⁵¹ The solver has now been in his problem space for a period of time. He knows other things about this case and has developed a model of it. He has already analyzed the "arduous work rule," as discussed above. But even if the employment history is sufficient for the "arduous work rule," functional limitations preventing return to heavy work are also crucial to the

148. Solver 3, Segments 53-61.

149. See Voss & Post, *supra* note 62, at 262, 272.

150. See *id.* at 179, 269.

151. See NEWELL & SIMON, *supra* note 1, at 108-09.

application of that rule. Given the very limited information on the claimant's functional limitations, what enables the solver to reach his tentative evaluation that the key evidence needed is proof that the hand will not respond to additional treatment? The key is his choice of case theory development, which structures this ill-structured legal problem as a particular legal planning exercise and which has already been identified with instrumentalist lawyering.¹⁵²

The "arduous work rule" has already been identified as a possible case theory, even though the important question of proving the functional limitation remains open. The early identification of a potential theory is a very useful, if risky,¹⁵³ planning step. The analysis of Solver 1's protocol offers an example of how an expert's goal can structure an ill-structured problem. The solver provisionally defines open questions to continue planning. Newell and Simon analyze planning as occurring in more generalized, simpler problem spaces.¹⁵⁴ In planning, one uses conditional statements like: "If it is true that the claimant's inability to use his right hand prevents him from returning to heavy work, then he will be found disabled if the 'arduous work rule' applies," to identify relevant issues to be explored.

Obviously, the planning space poses certain risks and has clear limitations. The clearest risk is that the planning will proceed on the basis of an incorrect factual assumption. In this example, if the inability to use the hand does not result in the inability to do heavy work, all the planning on that assumption is wasted and risks¹⁵⁵ an incorrect solution. An important limitation on the planning space is that it is only a plan—it is not a fully specified solution.

In a well-structured problem, planning is not predictive in the sense that one does not predict all even numbers will be divisible by two without remainder; rather, one recognizes or proves that general condition and uses it to reach other conclusions. In ill-structured problems, planning is, at least in part, predictive of the manner in which the problem will become structured as the open questions are answered. Ill-structured problems have well-structured

152. It was only in the course of this research that I came to realize how strongly instrumentalist my own lawyering is. I initially thought of this solver as the most "lawyerly," but I have tried to step away from that judgment, with only mixed success. My reaction reflects my own experience that many practicing litigators in high volume public interest settings use case theory development as their operating goal in initial assessment. Some reflections on that style of lawyering are offered, *see infra* Part IV.C. Adequate treatment of that subject, however, will have to wait for another day.

153. On the risks of planning spaces, *see infra* note 158.

154. *See* NEWELL & SIMON, *supra* note 1, at 77, 433. We can plan by bracketing off certain questions for later answer, either predicting the outcome or planning for each possible eventuality.

155. The degree of risk depends upon how many other possible theories are identified and pursued. *See* MacCrate Report, *supra* note 29, at 145 ("Settling upon a plan of action . . . should take into account . . . the portions of the plan that may need to be revised as the missing information is acquired.")

facets, and legal problems almost always mix the two kinds of planning: one involving abstract logical relationships and the other involving predictions.

For this experienced fact solver, the planning that identifies the "arduous work rule" as a possible theory rests on at least two predictions: (1) that the claimant's inability to use his right hand will result in a legal ruling that he cannot do heavy work, and (2) the "arduous work rule" will be found applicable. The protocol gives us no evidence for the process behind either prediction.¹⁵⁶ The planning is only predictive in part, however, because the lawyer is both predicting and influencing the outcome. The lawyer can make "bad" predictions accurate by influencing the situation to achieve an outcome that was unlikely if the analysis had not factored in the particular skills of the lawyer.¹⁵⁷

The planning space and planning goal solutions are not likely to fully answer all the questions presented by the actual problem. Although the planning exercise takes on a well-structured appearance, implementation of the plan will often face difficulties inherent in the ill-structured, contingent nature of the problem. In the end, the planning is only as good as the identification and use of the key facts or abstractions.¹⁵⁸ That takes us back to the quality and organization of the experienced solvers' knowledge and self-monitoring.¹⁵⁹ Successful use of the planning space requires the knowledge to make predictions, to assess the quality of the predictions, and to integrate that information into a plan that will inform a variety of contingencies, depending upon the fit between the predictions and the actual outcomes.

This legal problem is particularly amenable to planning for a reason specific to this kind of problem. Litigators frequently use "case theory"¹⁶⁰ to

156. The formulation "if inability to use the hand prevents heavy work then he is disabled if the arduous work rule applies," is also a logical chain, but there is no evidence that the solver reached it by deductive reasoning. One could argue that automaticity reflects very rapid, or encoded, application of logical rules. The rapidity argument does not account for the much slower application when the subject verbalizes systematic application of rules, such as when he works out the math involved in calculating how long the claimant worked. The encoding argument only pushes the question back to the issue of how categories are constructed.

157. This is an example of the failure to consider each solver's individual differences, e.g., the solver may be a weak legal reasoner but such a dogged investigator or so persuasive an advocate that his clients do well despite the gaps in legal theory. In problem solving terms, those individual differences are referred to as "production proficiency," see *supra* note 69, and differences in that dimension make overall evaluation of legal problem solving problematic. See *supra* notes 79-81 and accompanying text.

158. One solution is to increase the factors considered and plan for more contingencies. Of course, as more factors are considered, the planning space gets larger, and its benefits in speed and generality decrease.

159. Self-monitoring is evaluating and correcting one's solving as one progresses. It is characteristic of expertise. See *supra* note 120.

160. Case theory, a persuasive fact/law narrative about historical facts, is one of the central

structure their problems, and case theories turn out to be classic examples of typically expert goals. The goal of case theory development, as the goal of developing a persuasive fact/law narrative, is explicitly a context-defining planning goal that reduces the size of the planning space as it introduces the risk of premature or incorrect prediction. To appreciate this point, we need to look at the abstract structure of problem solving goals.

Because all problem solving involves movement toward some goal, every problem solving episode, by definition, must have a goal. Goals can either be context-specific and contain a great deal of information, or very general and contain little information, as we saw in the rule application example. Experts' goals are tailored for rapid solving in particular settings. Novices' goals are less specific and often require reference to information not contained within the goal.

Consider two different goals for doing a jigsaw puzzle. A simple goal would be "finish this puzzle." The solver would compare the current state to the goal to see if the puzzle is finished, according to some definition of a finished puzzle found elsewhere (in another knowledge state, as the cognitive scientists would say)—all the pieces are used, the holes are filled up or the picture is completed.

A richer goal would be to "duplicate the picture on the front of the box." That goal offers information about method within itself, without reference to any other knowledge state.¹⁶¹ In that formulation, the goal combines substantive knowledge with a procedural device, a way of testing when the solver meets the substantive goal. Research shows that expert thinking uses goals that combine both substantive and procedural knowledge in a single step.¹⁶² Novices typically separate the two, and may not reach the substantive question if they start with a procedural view, or vice-versa.

Pursuing the goal of case theory development focuses the solver on combining substantive and procedural knowledge in a single step. The facts suggest a potential legal theory, such as the "arduous work rule," and the goal of case theory development gives us the procedural guidance on what to do with additional facts as they come along. A well-stated case theory,

planning tools in litigation. A very perceptive and rich discussion of the concept is offered by Binny Miller. See Binny Miller, *Give Them Back Their Lives: Recognizing Client Narrative in Case Theory*, 93 MICH. L. REV. 485 (1994) (collecting and critiquing traditional notions of case theory and using the centrality of narrative in persuasion and storytelling to argue for a richer view of storytelling which is both more powerful in the case and more accessible to clients).

161. This is an "embodied goal," to use Lakoff's language. LAKOFF, *supra* note 59.

162. See Anzai, *supra* note 12, at 67; Voss et al., *supra* note 12, at 193 (analyzing experts' goals). Physics experts possess well-organized abstract knowledge for constructing abstract problem representations from the viewpoint of underlying principles, as well as specific knowledge of solving problems in domain-dependent and procedurally efficient ways. See, e.g., Klaus Schultz & Jack Lochhead, *A View From Physics*, in VIEWS FROM THE CONTENT DOMAINS, *supra* note 12, at 99.

presenting both the law and a persuasive factual statement about how the facts fulfill the legal requirements, locates and gives the solver direction in the problem space. Of course, as already observed, structuring the problem one way risks closing off the paths to the answers that lie down other roads not taken.

Goals other than case theory identification can also structure this SSD problem. For example, the problem is even better structured by the goal of listing the next steps to be taken to represent this client. These include getting medical records, interviewing the client and opening the file. The problem specifies more of the information, and presents fewer open questions for the task of generating a "to do" list of further research and investigation. If the goal is identified as formulating a case theory, the problem is less well-structured and presents many open constraints, including gaps in the factual record, and uncertainties about how the solver will decide a variety of legal issues. The goal of case theory identification, however, has the potential to take us much farther down the road toward the ultimate goal of representing the client.

Even the most basic goal identification can be a vexing problem for an inexperienced legal thinker, who most needs to know "how on earth do I get started,"¹⁶³ but is least able to identify context defining goals. The inexperienced solver can survey the range of possible goals, but will most likely identify only substantive legal goals which have little or no procedural information and provide little guidance about how to reach the substantive aspect of the goal. On the other hand, consideration of only procedural goals will leave the solver with a different, but still significant gap. Approaching each separately and combining the two requires searching through two very large, contingent spaces, the proper combination of which is one of the most useful of expert strategies.

Although the model addresses the context-defining role of goals in problem solving¹⁶⁴ and the structural aspects of goals, it says nothing about goal identification. The goals of the simple and well-structured problems considered by Newell and Simon are both determinate and objective. The puzzles have a right answer and the goal is to find it.¹⁶⁵ A hallmark of an ill-structured problem is the lack of an agreed-upon right answer.¹⁶⁶ The solver's

163. Amsterdam, *21st Century*, *supra* note 20, at 614.

164. More needs to be studied about the interrelationship between goal identification and task environment. See *infra* Part. IV.C.

165. The difficulties arise in structuring the goal so it provides useful information in the solving process.

166. Indeed, lack of agreement about goals, context and perspective is a hallmark of an ill-structured problem. See Voss & Post, *supra* note 62, at 280. In the pragmatic spirit, Reitman treats the issue of closing constraints in relation to members of a problem solving community. He notes that a

first problem is choosing a goal. The model can help analyze that choice,¹⁶⁷ but it is itself an ill-structured problem about which there will never be complete agreement. Unlike the constructed world of puzzles, where an operation leads to where application of the rules says it leads, or even the appellate world of relatively fixed records, the lawyering studied here occurs in a much more contingent world.

4. Recall and Use of Concrete Particulars

The experienced solvers are able to recall and use very concrete and particular information, while the inexperienced solvers use less accurate and general formulations. To take one example, the experienced solver says:

He would be categorized as a person closely approaching advanced age. Under the "regs." So, he would be—his education is—hmm. It's going to fall under the "limited or less" category. Unskilled, which would be disabled for—for Sedentary. Under Rule 201.09. And even if he was a high school graduate, and he had completed it a long time ago, he would be found disabled if we can—characterize his past relevant work as unskilled. Which seems to be the case. But—probably want to check the Dictionary of Occupational Titles, just to be sure what they characterize a stockperson as. It might require some—some types of skills, but not many. So, he's probably gonna win on the grids.¹⁶⁸

Note his attention to the actual printed rule and detailed analysis of separate factors of the rule.¹⁶⁹ Typical of the inexperienced solvers is this example of lack of attention to the actual language of the regulations, imprecision in the analysis, and even the characterization of the facts in this segment:

So I guess first I would look to whether he can—get off the grid or— go to the grid. That would be the easiest one with his age and his education and his work experience. And it seems as though he would. I mean he's over fifty, he's had limited education, steady employment in only unskilled jobs Okay—he would be

problem is ill-structured with reference to a community of solvers who do not agree on the proper operations or solutions to a given set of problems. *See id.* It is a vast understatement to note the applicability of that description to the law.

167. The model may introduce a bias in favor of goals that make ill-structured problems present their better structured aspects.

168. Solver 1, Segments 38-42.

169. This depth of attention to the rule can be contrasted to the inexperienced solvers' tendencies to ignore the details of the rules.

already advanced age. So. Yeah, it was 201.01. He's advanced age. He's had limited education and unskilled work experience. So he would be disabled.¹⁷⁰

This subject's model accounts for proof issues and addresses the legal issues in a coherent fashion. She analyzes both listing and grid arguments, but each is incomplete. The claimant's age, fifty four, is "closely approaching advanced age," not "advanced age," and the proper rule is thus 201.09. Although he is disabled on that rule, more complete analysis would show that at his age, the key question is whether he can perform light or sedentary work. This subject, however, only analyzed the sedentary work grid.

Her listing analysis is even less useful than her analysis of the grid arguments. She incorrectly assumes that some back problems, those requiring surgery and overnight hospitalization, qualify under the listing.¹⁷¹ This subject uses experienced kinds of thinking; the rule application is forward thinking, with reliance on recall, rather than looking the rule up. This inexperienced solver's knowledge is not sufficiently structured to allow for accurate enough recall to use that approach successfully, nor does she self-monitor, or correct herself, as she goes along. She lacks a detailed enough model against which to test her conclusions. These differences in accuracy and precision were consistent throughout the protocols.

It is not enough to say that the experienced solvers know more law, because the inexperienced solver in this example was reading from the regulations, as was the experienced solver. There is more here than just how much one knows; the development of structured knowledge, or the lack of it, determines how one uses what one knows. This section has highlighted some advantageous features of experienced solving, including speed, greater accuracy and superior recall of both facts and rules. It has even argued that experienced solvers are more apt to reach correct results. While the section also noted some of the problems that come from the use of planning spaces, there is more to be noted about the risks of experienced solving strategies.

Although the speed and automaticity that typifies the use of expert cognitive strategies often leads to correct answers in areas where there are right and wrong answers, they do not guarantee correct, or even good, answers. While some cognitive scientists have operationally defined experts as people who are usually correct,¹⁷² that definition has little use in areas like

170. Solver 5, Segments 47-53.

171. See Solver 5, Segment 55.

172. By studying those who use expert strategies to arrive at correct answers, cognitive science hopes to understand how those people avoid the pitfalls discussed here.

the law where the rightness of an answer is often the subject of the dispute,¹⁷³ and expert thinking has its own pitfalls.

The expert's reliance on patterns, speed and limiting the size of the problem space can lead to formulating solutions on the basis of incomplete information. This leads to rote application of familiar solutions that do not fully solve new problems and simply fail to analyze new situations.¹⁷⁴ Professor López rightly criticizes the lawyer who too quickly categorizes and "solves" a new client's problem.¹⁷⁵ Using expert strategies does not automatically make one the sort of expert worthy of special respect.¹⁷⁶ Nor does expertise produce good results in all kinds of cognitive tasks. Even experts who are proficient at domain-specific tasks or are amenable to evaluation display mediocre performance at predictive tasks.¹⁷⁷ Experienced thinking is different from inexperienced thinking, and continued exposure to a given subdomain will inevitably lead solvers to use experienced solving strategies. The question is not whether one is better or worse than the other, but how coming to understand each can help us to avoid the problems and accentuate the strengths of each kind of reasoning.

B. The Subexpert—How Far Does Command Over Related Knowledge Get You?

Another perspective on the role of domain-specific knowledge in problem solving is provided by the protocol of a subexpert, a solver with expertise in a related domain and some very basic knowledge of SSD cases. In this case, this type of solver is a law professor with eight years of trial level and

173. See *supra* note 162 (explaining ill-structured problems and the debate over defining correct answers).

174. See Blasi, *What Lawyers Know*, *supra* note 20, at 347.

175. See López, *supra* note 33. When I described this project to many lawyers, specifically the fast reasoning characteristic of experienced thinkers, they criticized "tunnel vision," or other versions of rote, uncreative lawyering. The most creative lawyer uses the same cognitive apparatus as the rigid lawyer. It is, of course, of central interest to identify the habits or modes of the two different kinds of thinking.

176. One of the many research topics beyond the scope of this article is to better define legal expertise to understand the difference between lawyers who do the same thing in every case and lawyers who are able to use expert strategies to see new solutions.

177. For example, simple statistical models are better at diagnosing mental illness from the MMPI, predicting business failure, predicting success for applicants for medical internships, and predicting future stock prices. See Eric Johnson, *Expertise and Decision under Uncertainty: Performance and Process*, in *THE NATURE OF EXPERTISE*, *supra* note 14, at 347. Human problem solvers are good at evaluating the implications of unusual cues, but are quite poor at weighing the small differences among a large number of base rate factors that are the key to statistical predictions. This is a function of the limitations of the processing system. Experts rely on their ability to spot patterns and isolate a small number of relevant facts, to compensate for the inability to crunch numbers, but apparently it is not a complete substitute. See generally Marjorie A. McDiarmid, *Lawyer Decision Making: The Problem of Prediction*, 1992 WIS. L. REV. 1847 (noting cognitive limits on human predicting in discussion of predictive models in the law).

appellate experience in federal criminal prosecution. He had been exposed to, but had not had direct responsibility for, SSD cases as a clerk on a federal appellate court.

This solver compensated for his lack of domain-specific knowledge by identifying goals around general issues of proof, using a litigation model from his criminal law expertise. He says:

I really would assume that a person who tells of sitting up to one hour, walking to the park about five blocks and lying down, is claiming not to be able to stand up to six hours. Let alone walk up to the six hours. Or lift up to twenty five pounds at a time. So given Mulcahey's report, you really do see. It seems there's quite a problem here. So the—the issue that begins to emerge is, to what extent can Social Security people defer heavily to Mulcahey's claims about Sims' capabilities without giving any due—any consideration to—to Sims' claims of his capabilities. 'Cause there is quite a clash here.¹⁷⁸

Using the information in the problem, this solver formulated the issue as whether the claimant's or the doctor's version of the functional limitations would prevail. This solver went on to evaluate how the clash would be resolved by turning to the regulations. As he skims the regulations, he says:

So again the—the focus is not on the prima facie question, but on whether the agency can rely on Mulcahey, and what can the agency—with what freedom the agency has to disregard the Sims claim. (PAUSE) Though I could have figured this out more easily, I'm sure, it does appear by the time that 40—404.513 that—medical evidence is needed for an application. So at least for now, I'm going to assume that Mulcahey was contacted by Sims for the application of a—I might be wrong. (PAUSE) Okay. Now what I really want to get to is standards for the decision.¹⁷⁹

This passage illustrates both the power and the danger of working in a planning space in an unfamiliar domain. This solver is able to use his general litigation expertise to put aside the factual questions for later consideration and to structure the problem to reduce the issue to a legal question. He is also able to effectively skim the regulations for an answer to the question of how the Agency will evaluate these competing facts. Unfortunately, largely because he lacks the domain-specific knowledge to properly assess Dr.

178. Subexpert, Segment 14.

179. Subexpert, Segment 22.

Mulcahy as the Agency's doctor and not as the treating physician, his tentative conclusion that this is a very weak case is flawed.¹⁸⁰

The subexpert identified the general issue of whether or not the claimant could work and looked, in detail, to the regulations to understand the proof rules. He did not identify any other possible basis for eligibility, or any of the issues raised by the lack of current care. This solver was conscious of his lack of domain-specific knowledge, noting after he was recorded, "I always say a little knowledge is a good thing."¹⁸¹

C. Identifying Legal Problem Spaces—Fact and Law

The transcripts revealed a cleavage among the solvers. Some talked a great deal about law, and some focused on the facts. In problem solving terms, the solvers searched through one of two different problem spaces—one containing possible solutions expressed as statements about the law, the other containing possible solutions expressed as statements about the facts of the case.¹⁸² The model predicts that all solvers will work in one of a very few different spaces for any given problem, and its principle of context specific problem solving says that analysis of those spaces will illuminate underlying features of the problem itself.

Among the inexperienced solvers, the fact and law spaces were quite discrete. Two inexperienced solvers talked almost entirely about the facts and barely mentioned the law. Although the law informed their solving as they sorted facts into legal categories and identified proof problems posed by particular facts, their representation of the problem was factual, and they talked about the problem as dependent upon the discovery and analysis of facts. On the other hand, two inexperienced solvers who focused on the law attended little to issues of factual development or proof. They manipulated and analyzed the law.

Among the experienced solvers, the distinction was more subtle, but still apparent. The experienced solver's use of facts reflected a strong conceptualization of the legal framework, including substantive bases of eligibility and proof issues. Nonetheless, she¹⁸³ talked about the facts, not the

180. This subexpert recognized that his evaluation of the doctor as the treating physician was key to his analysis and closed his assessment by saying: "But, unless this is—unless we find out more about Dr. Mulcahey, which I certainly would want to, before tossing this aside. I would not be very positive about Mr. Sim's chances here." *Id.*

181. *Id.*

182. There may be other problem spaces for this problem. Although the fact and law spaces appear the most common, the nature of any other spaces is beyond this research.

183. Among eleven solvers, all five men solved in the law space, while three of the six women worked in the fact space. This may be consistent with research suggesting women think more contextually.

law, and tended to make arguments in which factual, rather than legal, premises were manipulated and outcome dispositive. The law-dominated solver talked mostly about governing legal principles and used them to construct arguments in which the factual record was taken as a given and the law was manipulated.

Newell and Simon argue that there is correspondence between, or among, different problem spaces for the same problem.¹⁸⁴ The particular problem can be expressed in each of the problem spaces. The information may be more or less available, and the translation from one space to another may be quite complex, but the same information can be expressed in any of the problem spaces for a given problem.¹⁸⁵

Newell and Simon's general observation about differing problem spaces for a given problem has a particularized application in legal theory. Commentators have long noted that fact and law are interdependent categories.¹⁸⁶ In lawyering, any particular case may be described by the set of legal principles that will combine to control it (in view of the facts) or the set of facts that will control it (in view of the law). In lawyering, fact and law define each other in the particularized, contextualized relationship that forms a given case.¹⁸⁷ Each takes on meaning in the light of the other and neither is cognitively useful without the other in the analysis of particular cases.

1. Some Characteristics of Fact and Law Spaces

Several features of the protocols identify solvers as fact- or law-oriented.¹⁸⁸ One measure is the frequency¹⁸⁹ with which solvers mentioned

The numbers in this study are very small, but this gender difference is worthy of further study. See *infra* Part IV.C.

184. See *supra* notes 55-57.

185. See NEWELL & SIMON, *supra* note 1, at 825. Availability of information is central to problem solving. Newell and Simon continue their discussion with analysis of the properties of spaces in which information is more or less available.

186. See *supra* notes 7, 18.

187. Fact and law are only alternate spaces for the same information when the solver's model is sufficiently developed to connect the two. Thus, among the inexperienced solvers, fact and law spaces are quite distinct, while the difference is a little more subtle between the experienced solvers.

188. This discussion analyzes six of the protocols, involving four inexperienced and two experienced solvers. The subexpert was not analyzed for lack of any comparison, and one inexperienced subject was eliminated because much of the protocol was self-monitoring verbalizations which made comparison possible only with extensive, and probably skewing, editing. Both those solvers worked in law spaces. The other experienced law solver, not discussed here, was strikingly similar to the experienced solver analyzed here, and to the author's own protocol.

189. To measure frequency, I first divided each protocol into segments. Each segment is a discrete observation about or analysis of the case. Depending on the style of the solver, segments could be phrases, sentences or paragraphs. The segments ranged in average length from 16 words for Solver 3, an inexperienced fact solver, to 30 words for Solver 1, an experienced law solver. Some of the differences

particular legal rules or principles.¹⁹⁰ The fact solvers mentioned legal rules or standards in less than twenty percent¹⁹¹ (eight percent for coder 2) of the segments.¹⁹² The law solvers mentioned the law in more than thirty-five percent (fifteen percent for coder 2) of their segments.¹⁹³ Of course, the division of the protocols into segments is a key determinant of these numbers, but another measure of the frequency of references to the law, as compared to simply the total number of words, shows a similar pattern. On average, the fact solvers mentioned the law about one time for every 113 words,¹⁹⁴ while the rate was about one time for every fifty-seven words¹⁹⁵ for the law solvers.¹⁹⁶

reflect those who spoke in phrases and those who used full sentences, while other differences reflect those who offered fuller analyses and those who analyzed less fully. For discussion of identifying the right unit of analysis, see ERICSSON & SIMON, *supra* note 46, at 266-73, 287-91. I also measured frequency against overall word count for each protocol to address the subjectivity of the division into segments. See *infra* notes 192-96.

190. The segments were then coded to reflect those that contained legal propositions and those that contained factual propositions. The determination of what counted as an explicit reference required judgment call, so a second reader independently coded the protocols. The results for each coder are provided, see *infra* notes 192-96. I am Coder 1. Coder 2 consistently counted only references to particular regulations, rules and statutes. I counted references to terms of art in the SSD area, such as references to the "grids," "RFC" or "treating physician," as well as references to particular regulations, rules and statutes. Thus, I counted a higher absolute number of law statements than did the other coder, but our counts differ quite consistently, and both sets of coding show a consistent difference between fact and law solvers.

191. Despite the use of numbers in this section, I reemphasize that this work is observational but not empirical or statistical in its method. I am offering these numerical comparisons to illustrate and to persuade. I invite others to join me in this kind of research and to generate enough data to perform a statistically valid study.

192. Coder 1 (author): Solver 3, 22 references in 126 segments (17%); Solver 6, 10 references in 56 segments (18%); Solver 2, 10 references in 59 segments (17%). Coder 2 (second reader): Solver 3, 8 references in 126 segments (6%); Solver 6, 3 references in 56 segments (5%); Solver 2, 5 references in 59 segments (8%).

193. Coder 1: Solver 5, 22 references in 57 segments (38%); Solver 4, 44 references in 109 segments (40%); Solver 1, 25 references in 52 segments (48%). Coder 2: Solver 5, 9 references in 57 segments (15%); Solver 4, 31 references in 109 segments (28%); Solver 1, 15 references in 52 segments (29%).

194. Solver 3, 22 references in 2033 words (92 words per reference); Solver 6, 10 references in 1012 (101 words per reference); Solver 2, 10 references in 1477 words (147 words per reference).

195. Solver 5, 22 references in 1102 words (50 words per reference); Solver 4, 44 references in 2659 words (60 words per reference); Solver 1, 25 reference in 1565 (62 words per reference). This measure tends to understate the difference because Solver 4's protocol had long passages in which the regulations were read verbatim. Those passages counted as reference to one or two legal rules, while significantly increasing the word count.

196. Using Coder 2's results, the ratios are: Solver 3, 8 references in 2033 words (254 words per reference); Solver 6, 3 references in 1012 (337 words per reference); Solver 2, 5 references in 1477 words (295 words per reference); Solver 5, 9 references in 1102 words (122 words per reference); Solver 4, 31 references in 2659 words (85 words per reference); Solver 1, 15 references in 1565 (104 words per reference). According to Coder 2's results, the fact solvers mentioned the law once for every 295 words and the law solvers mentioned the law once for every 103 words.

The protocols generally followed a pattern in which the solver would review the information and then restate the problem, permitting comparison among the solvers of the segments following each of their restatements of the problem. The fact solvers identified factual development as their first concern. Typical was the fact solver who said:

What would I do about this? Okay. Well, the first thing I'd have to do is find out, I think that this information that you gave me is greatly lacking in medical records. And the first thing I would need to do is find out who this doctor is. If he's a Social Security doctor or if he's a treating physician. I'd obviously, oh, it says, he says he has three surgeries in fourth months. I have no records of any of the surgeries here. I have no records that this is the doctor that performed the surgery. I have no records from the doctors that performed the surgery. So that—that's really the first thing that I—I would have to do because pursuant to this one medical report it doesn't look like, it doesn't look like he really would be disabled. And if he is disabled that he really can't work. Then I—I would need a lot more information about, about this medical history. So I think that's the first step that I would take. I—I would definitely want to meet with him, I'd want to talk to him. I'd want to see how he acts.¹⁹⁷

In contrast, the law solver says:

So I guess first I would look to whether he can—get off the grid or—go to the grid. That would be easiest one with his age and his education and his work experience. And it seems as though he would.¹⁹⁸

The first two solvers in this set of four turn to factual development. They want to get more records. The second pair of solvers in this example turn to the law after restating the problem.

Of course, both fact and law are mentioned in these excerpts. Solver 3, a fact solver, wants to know if the doctor is a "treating physician,"¹⁹⁹ a technical legal concept. But the solver sees it as a factual question needing investigation, and goes on to discuss other areas needing investigation. In contrast, Solver 4, a law solver, turns to an argument that might be developed

197. Solver 3, Segments 53-66, 70-73.

198. Solver 5, Segments 47-49. See also Solver 4, Segments 29-31.

199. Solver 3, Segment 48.

factually (whether or not the claimant can do light work), but turns to the law to see what rules might answer his question.²⁰⁰

Solvers in the "law space" talk about the law more and turn to the law earlier to frame their solving. Solvers in the "fact space" analyze the facts, without talking about legal research or legal theories for a much greater proportion of their solving. For example, Solver 4 first mentions looking at the regulations about three quarters of the way through the protocol.²⁰¹ Experienced fact Solver 6 turns to the theory of the case more than three quarters of the way through the protocol,²⁰² saying:

Can't promise to go with him to the hearing That's about it. Do you want my theory of the case? My theory of the case which I didn't even articulate and I probably should. Looks like the back pain isn't severe to do much for him. However, he can't use his right hand for fine manipulation. He can't do—he probably can't even do light work because of the weight lifting. If it's true that he can't lift with his left hand because it throws him off balance, he—most unskilled sedentary and light jobs require good manual dexterity. He can—he's just barely learning to hold a fork in his left hand and he doesn't have bimanual dexterity. My theory of the case is even without the psychological, he's not gonna meet a back listing. I don't think there's a listing for one hand. You've gotta have one hand and one foot or two hands. So I don't think he's gonna do that. But just that there are no jobs he can perform given his limitations.²⁰³

The law solvers turn to the law much sooner,²⁰⁴ but focus less on factual investigation.

Although there were no differences in the frequency or placement of discussion of the law between the inexperienced and experienced fact solvers or the inexperienced and experienced law solvers, there were differences in the solutions reached at the end of the solving session between the experienced and inexperienced solvers. Although both inexperienced and experienced fact solvers talked about the law less and later, the experienced fact solver framed an argument and articulated a plausible case theory. The inexperienced subjects who worked in the fact problem space did not predict

200. Although the solver looks to the listing first, he does eventually consider the regulations about functional limitations which help answer the question about light work.

201. See Solver 4, Segment 108 after 1624 words out of 2033 total (80%).

202. See Solver 6, Segment 48 after 1202 words out of 1477 total (81%).

203. Solver 6, Segments 48-56.

204. See Solver 4, Segment 29 after 744 words out of 2659 total words (28%); Solver 1, Segment 16 after 335 words out of 1460 total words (24%).

an outcome or offer an evaluation of the strength of the case. The experienced solvers worked in different spaces but reached similar conclusions. As will be developed below, for the experienced solvers the two spaces are alternate expressions of the same information.

In contrast to the inexperienced fact solvers, both inexperienced law space solvers suggested particular arguments that would lead to a positive result for the client, although neither identified all the arguments discussed by the experienced solvers. If all solvers need both fact and law to reach legal theories in a case, then factual information may be more available to the inexperienced solver in the "law space" than is legal information in the "fact space."²⁰⁵ For the inexperienced solver the "law space" also poses the risk associated with working in a planning space, a problem not associated with the "fact space."

That risk is illustrated by Solver 4, the subject whose use of backward reasoning to identify the arduous work rule was discussed above. Although he identified the arduous work rule, a less obvious and quite powerful legal theory,²⁰⁶ he recognized no other legal bases for eligibility. Thus, as a planning exercise to identify potential legal theories, this solver's solution is incomplete. Typical for a law structured planning approach to this problem, his factual analysis is quite sparse.²⁰⁷ Much of the work of the inexperienced solvers consisted of identifying relevant aspects of the problem and sorting them into the proper categories. The fact solvers identified relevant facts and the law solvers identified relevant legal rules. Simply as a matter of efficient use of limited cognitive resources, the solvers took either law or fact as a given and searched for the other to define a smaller problem space and used a limited number of operations. The ill-structured nature of the problem put a premium on decreasing the size of the problem space. Inexperienced solvers tended to talk about one aspect and treat the other as a closed constraint. Those who focused on the facts used an abstract version of the law which permitted them to identify relevant legal categories, but did not require much close legal analysis. They did not return to pursue further legal analysis by

205. The "law space" may also make it more likely that the inexperienced solver will make a prediction because predictive information related to that rule is also more available in the "law space." If the right rule is found, a prediction can be made. For the fact solver, once the relevant facts are identified, the rules must then be separately attended to in order to gain outcome predictive information.

206. The argument is powerful in the sense that it might use undisputed facts to invoke a dispositive rule. There is, however, uncertainty about whether the rule applies in this case—neither Mr. Sims' work history nor the contours of the rule are known in sufficient detail to permit a reliable judgment, so sole reliance on that argument is risky at this stage.

207. I suspect that planning in the "fact space," on the other hand, is correspondingly less likely to eliminate legal theories, in part simply because the legal theories receive less attention, but more fundamentally because the very specificity of facts makes them less powerful structuring devices.

explicitly discussing how the law could affect their analysis, ignoring the fact that law served the same function as a structuring device.

2. How Experience Closed the Gap Between the Spaces

Although the two problem spaces led to different kinds of solutions among the inexperienced solvers, the experienced solvers used the two differently to reach similar solutions. Both identified legal theories that reasonably structured their case development plans at this early stage.²⁰⁸ The experienced thinkers' use of different spaces to similar outcomes results from structuring their knowledge to integrate fact and law. Whether the experienced thinker thought about a legal or factual issue, each was already processed, or structured, in the light of the other. Each experienced thinker used forward reasoning to apply models in which much of the application of the general to the specific had already been worked out. In effect, fact and law become interchangeable labels to call up the same models once structured knowledge integrates fact and law.

The experienced "fact space" solver, Solver 6, began with the intake form and like her "law space" solving experienced counterpart, Solver 1, she analyzed the case as she read along. Reading through the employment section, she offered the following forward application of the past relevant work rule:

His p—he can't do his past work. Warehouse is heavy work. Can't do digging. He's got a good work history if it shows up on the earnings record. Bread delivery route helper he might be able to do but probably not cause the bread is heavy when they carry it.²⁰⁹

As an experienced thinker, she first verbalizes the application of the rule and then offers arguments in support of her conclusion. Like the first experienced thinker, she continues attending to the past relevant work rule, sees a potential problem with the analysis, and resolves it. On the level of the productions, we see another example of an expert using structured, domain-specific knowledge for a forward application of a rule. The content of the productions is, however, different.

This solver's model, Solver 6, produces a concern about whether this claimant could return to (or be found able to return to) his past work as a bread truck driver. She answers that question with a factual observation—delivering bread requires heavy lifting. The first solver, Solver

208. Perhaps the more important observation is that both are experienced advocates who have used these differing approaches in representing many successful claimants.

209. Solver 6, Segments 8-10.

1, addressed the issue of the earlier jobs with the legal observation that jobs held more than fifteen years ago are not relevant to the past relevant work rule.²¹⁰ Of course, both solvers use both fact and law to address the past relevant work issue, but Solver 1 applied a legal rule (the fifteen year limit), while Solver 2 treated a factual matter (the weight of the bread) as dispositive.

Solver 6 also addressed the issue of the claimant's infrequent care factually. After reading through the material and reposing the question as "What do I do now," she talked about getting releases for medical records and said:

Tell him that he needs to see a doctor more often than once a year. That that's absurd . . . Hopefully, he's wrong when he says he only sees an orthopedist once a year and sees no other doctors. If he is seeing any other doctors, obviously we're gonna get stuff from that. I'm gonna ask him why he only sees an orthopedist once a year. That's not very often. I can understand it with the hand. If the hand is beyond repair, it's not worth seeing a doctor about, but if he has back pain, you would think he'd want something better than Tylenol and aspirin. And he has Medicaid so there's no reason why he wouldn't see a doctor more often. If he's not seeing a doctor more often, I'm gonna tell him to go back to Beth Israel, see a doctor about his back pain, maybe they can pull up his old records and get ongoing treatment.²¹¹

The section begins with the statement that the claimant needs to see a doctor more often.²¹² As she continues, she considers the issue from the claimant's perspective and notes that while the hand may not require further treatment, Mr. Sims should see a doctor about his back to eliminate whatever problems would flow from the lack of regular treatment.

The first solver discussed the issue of infrequent medical care as a legal problem during the analysis of the medical history, and concluded that a statement from the doctor that no further treatment would improve his condition or resolve the problem.²¹³ He does not plan to alter the fact of the client's treatment. Rather, he would secure an expert opinion that directly

210. See *supra* note 128 and accompanying text.

211. Solver 6, Segments 31, 35-38.

212. That may be a general observation that he seems to be getting inadequate care or it may be a hortatory comment. In that latter light, the statement would reveal this lawyer's view about her role. Whether or not the comment "that's absurd" reflects views about the maldistribution of health care, the subject of infrequent care is also usefully analyzed as an approach to a very typical proof problem in these cases.

213. See *supra* note 156 and accompanying text.

supports²¹⁴ a legal finding that no further treatment is necessary if not efficacious.

Solver 6, in contrast, would counsel her client to see a doctor. She thinks about altering the facts in the record, rather than using the law to shape an argument that these facts should lead to a good result for her client. She focused consistently on the facts of the case throughout her problem solving, discussing the kinds of questions she will ask the claimant during an interview. In contrast to Solver 1, she would explore the details of her client's emotional state and his daily social interactions.²¹⁵ She is interested in a wider set of factual issues and plans the factual development of the case. In contrast to some less-experienced solvers, however, her development of a factual theory takes place in a fact-dominated space that is nevertheless strongly shaped by the law.

IV. THINKING LIKE A LAWYER REVISITED

A. *Teaching Lawyerly Thinking*

We cannot directly teach students to think like lawyers by analyzing or modeling the thinking of experts.²¹⁶ Each student must build his or her own cognitive models, using substantive knowledge and experience and using that knowledge to organize what he or she has learned to make it useful in the world. The now less common black letter law classroom, in which students are told the rules, is fading because we recognize that although many students come away with an abstract understanding of the ideas presented, the knowledge acquired in that classroom is essentially flat²¹⁷—the ideas can be recalled, but the ability to relate one to another is often quite limited. If that student, however, gains experience with doing something with those ideas, through a contextualized problem, a clinic or perhaps even by hearing a story that offers context and provokes thought, that flat knowledge folds up or becomes structured. Relationships develop among the concepts and they assume a complicated form which permits a web of interrelationships among the ideas to emerge and be used. The formerly flat piece of paper upon which

214. Under the treating physician rule, that opinion could be all but dispositive on that issue. See 20 C.F.R. § 1527(d)(2) (1996).

215. See Solver 6, Segments 39-41.

216. I caution again against reducing all lawyering to expertise in problem solving. Clearly there is a great deal more we must teach, particularly about the affective aspects of lawyering. See generally Carrie Menkel-Meadow, *Narrowing the Gap by Narrowing the Field: What's Missing from the MacCrate Report—Of Skills, Legal Science and Being a Human Being*, 69 WASH. L. REV. 593 (1994).

217. This, and the spatial images that follow, are only metaphorical, not an effort to take a position on the complex technical debate among cognitive scientists about how to describe structures of knowledge.

the ideas were first written becomes an intricate origami. The folds bring formerly distant concepts into close proximity and relate ideas multi-dimensionally.

Organization, or structuring, of knowledge comes by using it to solve problems. Although law students may need to start out learning some rules, they also need to start using them so they organize their knowledge. This study offers some theory about why we cannot teach skills without substance, nor usefully teach that much doctrine without having students use it so they can structure it for themselves. Using doctrine requires analyzing it in relation to particular facts and goals and permits students to develop their problem solving abilities.²¹⁸ Similarly, fact analysis must be introduced²¹⁹ in relation to doctrine and goals. One central problem is that we cannot offer the whole picture all at once. If we realize, however, that we start with a focus on doctrine because it is too hard to teach both fact and law analysis together at the beginning of law school, we might better calibrate how much doctrine-centric teaching we need.

The suggestion that students be more active in the classroom is surely not new. Most full-time law teachers talk about the importance of teaching first year students to think like lawyers, a formulation that makes students active and stresses process over simply learning doctrine. That orientation informs problem-based teaching, which gives students opportunities to think about law and fact against a background situation and with reference to particular goals.²²⁰ This study suggests a theoretical framework that explains why pursuing that kind of learning best advances the goal of training lawyers for practice.

Although we are right to talk about teaching first year students to think like lawyers, as I have argued that the law demands its own style of thinking, so does each area of knowledge. Therefore our focus on teaching first year students is too narrow. Although the doctrine-centric view sees lawyering primarily as one kind of overarching skill or intelligence, "thinking like a lawyer," which enables a "good lawyer" to solve any legal problem is a more useful analysis of lawyerly thought, and the proper bounds of specialization

218. Not all doctrinal areas use the same kind of reasoning. We typically say that constitutional analysis is different from statutory analysis, an observation consistent with the context sensitivity of problem solving.

219. Indeed, it is not intuitive and is a proper law school subject. "After all, practitioner/teachers likely to think of the skill of fact analysis as intuitive always seem to be at a loss to explain why it is that their intuition seems to consistently serve them well, while the intuition of their beginning students always seems to come up short." Kainen, *supra* note 8, at 1091.

220. Use of problems shares with the clinical method the use of simulated or real case lawyering to give students experience. See generally Phyllis Goldfarb, *A Theory-Practice Spiral: The Ethics of Feminism and Legal Education*, 75 MINN. L. REV. 1599 (1991) (identifying simulated or real cases as central elements in clinical legal practice).

in the law results if we understand lawyering as a bundle of expertises, each defined by their goals. The traditional conception of thinking like a lawyer corresponds to an identifiable expertise—appellate lawyering. The appellate expert manipulates rules against a background of largely immutable facts. Law school teaches that expertise because it is a distinctive part of lawyering. But the excessive focus on that expertise may be explained by the fact that as hard as doctrinal analysis is to learn, it is easier than manipulating both doctrine and facts at the same time.

As the protocol of the subexpert demonstrates, the appellate expert lacks the expertise that enables expert lawyers to represent clients in new trial level situations. The appellate attorney certainly knows how to analyze doctrine, but lacks both substantive knowledge and domain-specific models for dealing with the much more ill-structured problem presented by initial case planning. Interestingly, in this study the appellate lawyer came up with a plausible sounding conclusion which just happened to be wrong.²²¹ Putting aside the very real issue of individual ability,²²² when we ask “What is thinking like a lawyer?” we should also ask, “Why is this lawyer thinking about the law?” The answer will vary with the lawyer’s goals. We contextualize our analysis of lawyering when we think about it with reference to particular goals.²²³

That is not, however, how we typically present lawyering in the academy. The dominant message, especially to first year law students, continues to equate lawyerly thought with the styles of analysis they learn in their first year courses. Too often, we ignore context or we think about the lawyer as judge without reflection. Lawyers do many different things towards many different goals. This study reminds us how important it is to critically examine our tendency to think only about the lawyer as judge, and perhaps as the judge who only hears cases based in the first year courses. Other roles, other goals, and other areas of the law require related but distinct ways of thinking. We

221. The subexpert, a very talented lawyer, recognized his limits and was reluctant to analyze the case because he lacked domain-specific knowledge. Not all lawyers, however, recognize their limits. The plausibility of the subexpert’s answer suggests some of the dangers of putting too much faith in the doctrine-centric view of thinking like a lawyer.

222. There are giants at the bar who do everything exceptionally well. Thurgood Marshall was, by one measure, the century’s greatest litigator and also an extraordinary judge. Lawyers like John Davis, Simon Rifkind and Edward Bennet Williams are rightly recalled as exceptional lawyers who did many things well. Individual difference plays a role in professional competence. Some people are able to gain expertise in more than one area and translate expertise in one subdomain into expertise in another more easily. But for the mass of us who toil closer to the average, professional expertise is narrower and harder to expand. Newell and Simon explicitly bracket individual differences.

223. This orientation is fundamental to philosophical pragmatism. Professor Grey identifies the distinctive core of pragmatism as the identification of thought as the goal-directed activity of solving practical problems, rather than a mental process (distinct from active pursuits in the world) focusing properly on theoretical concerns. See Grey, *supra* note 21, at 814.

should examine whether we are doing enough to stimulate second and third year students to structure information in the more specialized areas of law they study.

Perhaps not unexpectedly, this study reaffirms my faith in clinical teaching while at the same time reorienting my goals. Live client clinics and, to a lesser extent, simulation courses, provide a valuable opportunity for students to gain the experience that this study shows is so valuable to them. What seems less valuable than I had thought is teaching about lawyerly thought by explaining how an experienced lawyer, often the clinical teacher, thinks about the problem. Although the experienced lawyer's thought process is occasionally of interest and limited value, this study suggests that even at the level of the development of analytic tools, our students must do it for themselves. We provide a setting, which hopefully maximizes their development. They must do the hard work for themselves.

B. The Danger of Lawyerly Expertise and the Power of Imagination

Although we must use structured knowledge to make order of the world, we must not be trapped by it. The feeling that a given solution is right comes from the psychological satisfaction of organizing a new situation according to an established model. If it feels right, it often is right—but not always. Conscious reflection provides a kind of evaluation different from our automatic response. Our automatic responses rely upon complex models from a host of unreflected-upon associations built up through experience. Responsible lawyering requires us to work to critically evaluate the automatic solution that can feel so satisfyingly right.

That evaluation is no simple task. After all, experience is a powerful teacher and we would not want to ignore the important lessons that are bundled into our automatic responses, even if we could. On the other hand, every case deserves a fresh look and a creative approach. This problem is most pressing when we begin to address a new problem. Amsterdam's question "How do I get started?"²²⁴ remains at the core of that lawyer's problem. That question is often ignored, perhaps because that core is often hidden from our view. We are so inundated with the problem of identifying goals for ill-structured problems that we just do it, using the automatic processes described in this study.

The core of the problem is that even conscious reflection takes us back to cognitive models, structured knowledge and automatic responses. We can use deductive logic to solve a puzzle in a formal system that forecloses

224. Amsterdam, *21st Century Perspective*, *supra* note 20, at 614.

argument over goals, context and perspective. After all, there is a provable right answer in a closed system. However, there is no deductive method for choosing a goal to an ill-structured problem. It requires an act of faith and imagination. But, as Winter has argued, much of our experience demands arguments about goals for ill-structured problems, not proofs in formal systems. For those arguments, the basic cognitive processes we use are imagination and metaphor,²²⁵ not deduction.²²⁶

At bottom, the lack of agreement about goals for ill-structured problems, like initial evaluation of a new legal situation, flows from the idiosyncracies in the way we categorize the world.²²⁷ On a cognitive level, each of us has our own view of the world. Because we think about things differently, we act differently. The process of resolving a legal problem is, on a very abstract level, the use of imagination to individually structure an ill-structured problem.²²⁸ Winter puts the centrality of metaphor and imagination at the heart of the problem of the lawyer as judge. His examples are from doctrinal reasoning, but his description of the centrality of metaphor and imagination

225. Winter calls this the constitutive nature of imagination and metaphor. Although Winter's "experientialist" epistemology is not central to the results of this study, it is consistent with Winter's view and offers a situated example of the operation of imagination and metaphor at the core of the solving process. See Winter, *Transcendental Nonsense*, *supra* note 20, at 1129-36 (discussing experientialism). Winter argues, relying on George Lakoff's work on human categorization, that the empirical evidence shows that our categories are not objectivist collections of things that have common properties. See *id.* Lakoff's first general theme is "that members of a category may be related to one another without all members having any properties in common." LAKOFF, *supra* note 59, at 12.

226. Deductive logic is not a constitutive element, but operates on a secondary level of general, justificatory discourse. See Winter, *Between Legal Power and Narrative Meaning*, *supra* note 7, at 2227 (summarizing the point in his introduction). As Winter points out, deductive logic plays a role in institutionalized meaning, but it is not the stuff of thought. See *id.* at 2259 (arguing that narrative, on the other hand, is constitutive of thought but insufficiently general to meet the test for law). The constitutive character of metaphor and the centrality of narrative in persuasion and decision-making is one of the central contributions of cognitive science to the law. See *supra* note 9. Analyzing constitutive cognitive processes should be distinguished from the very different enterprise of analyzing the role of metaphor in persuasive, constructed arguments. See generally Sunstein, *supra* note 2, at 743 n.7 (citing Mark Johnson, *Some Constraints on Embodied Analogical Understanding*, in *ANALOGICAL REASONING: PERSPECTIVES OF ARTIFICIAL INTELLIGENCE, COGNITIVE SCIENCE, AND PHILOSOPHY*, 25, 39 (David H. Helman ed. 1988)).

227. Some members of a category may only be related to each other through a central case, and have no common properties. The central case, in turn, is structured around a "schema" or "recurrent pattern, shape, and regularity . . . chiefly at the level of our bodily movements through space, our manipulation of objects, and our perceptual interactions." Winter, *Transcendental Nonsense*, *supra* note 20, at 1147 (quoting Johnson, *supra* note 221). Arguments relating the two disparate members of the category without reference to the central case would likely be quite weak, while an argument structured around the schema may be quite convincing.

228. As legal cases move through the courts, they become more structured. Once a trial court has developed a factual record and identified the legal issues, the events in the world which gave rise to the case have been shaped, limited and defined. If the case continues, the universe of possible goals has been greatly limited, the problem has been structured and the problem space narrowed. The appellate problem is much better defined than the problem of initial case evaluation.

more obviously applies to the interchangeable fact and law reasoning of the early stages of a case.²²⁹ That is, when the often unconscious choice of context, the development of schema relating fact and law, when neither has been defined, and the identification of goals are revealed as case-defining acts of individual imagination.²³⁰

We can imagine the goals that fundamentally shape our lawyering. Perhaps more importantly, once we imagine them, we use them repeatedly and without reflection. Although we cannot spend all our time in recursive navel gazing, time spent in conscious reflection upon our goals, and developing other goals not immediately presented by our useful but imperfect models will ensure we have imagined the best world for ourselves.

C. Further Study of Thinking Like a Lawyer

I want to outline two areas ripe for further examination. In this study, bracketing analysis of the lawyers' choice of goals was necessary but problematic. In this initial study, my own evaluation of the solvers as lawyers, based largely on their reputations within the New York City SSD Legal Services Bar, supports the basic assumption that their "solutions," or overall representation of the simulated client, would have been examples of equally good, if not identical lawyering.²³¹ That assumption, which brackets a very important and interesting question, was necessary in this initial investigation of lawyerly problem solving. However, a few tentative thoughts about evaluating solutions to lawyerly problem solving and possible differences between lawyering in "fact" and "law" spaces suggest how important it is to offer a fuller, contextualized account of the process of choosing lawyering goals.

In the protocols examined above, the instrumentalist goal of theory identification led to the more structured planning approach of the law oriented solver. The fact solver's broader goal of finding factual solutions to the client's problem led to solving that structured the problem less and left more

229. I suspect that some of the resistance to Winter's ideas stems from the fact that the imaginative elements have become fixed elements by the time the legal situation has become a legal opinion. In that form, the problem is better structured and more easily modeled with deductive logic. That does not diminish the force of Winter's argument, but it does make it less intuitively appealing. As a colleague suggested to me, we act as though Winter is wrong and engage in "normal" legal reasoning, whether he is actually right or wrong.

230. When Newell and Simon chose formal systems for their initial experiments, they provided a uniform set of meanings to all the solvers. Problem solving research in natural systems must account for the complexities of imaginative and metaphorical meaning.

231. See Voss & Post, *supra* note 62, at 280 (looking to the community of solvers for judgments about solutions to ill-structured problems). The law holds lawyers to standards of practice defined by community practices. See *Strickland v. Washington*, 460 U.S. 668 (1984).

open constraints. The relationship between these two solving approaches in a particular solving episode and the overall outcomes of the cases should be examined.

Do lawyers characteristically use either fact or law solving spaces in all of their solving, or do they use one space for one sort of problem and others at other times? Examining solving at different stages of a case would reveal whether lawyers move between spaces for different kinds of tasks. Another important dimension to the question of whether a lawyer characteristically uses one space or another is the relationship between different kinds of legal problems and different spaces. Are there differences between transactional and litigation lawyers or plaintiffs and defendants?²³²

Another important question is the relationship between goals and spaces. Although it is clear that the goal of case theory identification goes with the "law space," it is not clear that the space is determined by the explicit choice of that goal. Equally likely is the possibility that lawyers disposed to solve in a "law space" identify case theories and use them, while lawyers disposed to solve in a "fact space" see fact-oriented solutions and pursue them. If disposition plays a significant role, how amenable is it to change? Will explicit identification of a different kind of goal change the space the solver uses?

As this study has made me more aware of how strongly my own lawyering tends toward solving in the "law space," I have reflected upon the confluence of disposition, practice area and the plasticity of lawyering goals. I have discovered how highly I value conceptualizing a case at a very early stage and pursuing that concept. Of course I must change my ideas as I learn new information, but I like to structure my problem very early. My formative practice setting, high volume federal criminal defense work, was appealing to me because it fostered and rewarded that kind of lawyering. That is, however, only one kind of lawyering. All lawyers solve problems, but different lawyers solve different problems in different ways. There is a lot more to be studied about those differences.

A second area for further study is the apparent relationship between gender and solving spaces, and the general subject of individual differences and solving. As noted above all five male solvers worked in the "law space," while the six women split evenly, with three working in the "fact space" and three in the "law space."²³³ Although a larger, statistically valid sample is required to explore whether there is a gender difference, the result is intriguing. The difference would be consistent with other work that suggests

232. For example, law manipulation, and thus "law spaces," may be particularly useful in those criminal defense cases in which the facts are beyond dispute.

233. See *supra* note 183.

differences in the ways men and women think about the law.²³⁴ Very broadly, the "law space" may be more amenable to the rule oriented, abstract thinking identified with, but by no means uniquely used by, men, while the "fact space" may be used by more situation specific, contextual thinking women. It would be interesting to explore connections among gender, as well as other individual differences, such as problem spaces and goal construction.

CONCLUSION

The insights of cognitive science problem solving research show that there is no description of one kind of thinking that can properly capture what it means to "think like a lawyer." Lawyers think differently about different areas of the law, and even within a given area, experienced lawyers use different cognitive strategies than do inexperienced lawyers. This has important implications for law teachers. We cannot just teach students to think like lawyers in the first year and be done with it. We must attend to developing their lawyerly thinking in each new area of the law to which they are exposed.

Even if we redouble our attention to teaching students to think like lawyers, we must contend with the fact that experienced lawyers think differently from inexperienced lawyers and that the development from one mode of thought to the other is an internal and highly individualized process. We can set up the conditions under which our students can best develop experienced styles of problem solving, but we cannot teach them to act through analyzing what we do or by illustrating it. Each person must come to his or her own personal combination of knowledge and experience to lawyer, or act in any role in the world.

234. See, e.g., RAND JACK & DANA CROWLEY JACK, MORAL VISION AND PROFESSIONAL VALUES: THE CHANGING VALUES OF WOMEN AND MEN LAWYERS (1989); Carrie Menkel-Meadow, *Portia in a Different Voice: Speculations on a Woman's Lawyering Process*, 1 BERKELEY WOMEN'S L.J. 39 (1985); Naomi R. Cahn, *Styles of Lawyering*, 43 HASTINGS L.J. 1039 (1992) (identifying gender differences in styles of lawyering).

