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2004

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### Recommended Citation

Stefan H. Krieger, *Domain Knowledge and the Teaching of Creative Legal Problem Solving*, 11 Clinical L. Rev. 149 (2004)

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# DOMAIN KNOWLEDGE AND THE TEACHING OF CREATIVE LEGAL PROBLEM SOLVING

STEFAN H. KRIEGER\*

*This article explores the relationship between students' knowledge of underlying legal doctrine and their ability to learn effective methods of practice in law school skills courses. One of the primary goals of skills training in law school, especially clinical legal education, is to teach students how to apply what they have learned in doctrinal courses in the "real world." While much has been written about training students in proper methods of practice and problem solving in skills courses, little attention has been paid to the significance of doctrinal knowledge to this training. Reviewing recent cognitive psychology research on the development of expertise and creativity, and in particular, a number of empirical studies examining the development of clinical skills in medical education, this article concludes that basic knowledge of substantive legal doctrine is a necessary prerequisite to learning effective legal practice. Skills law teachers, for the most part, have incorrectly downplayed that role. The article concludes by proposing some curricular changes in skills and clinical programs to take into account the role that legal doctrine performs in learning effective methods of legal practice and suggests future empirical studies on the relationship between legal doctrine and skills training in the legal education setting.*

Recently, I assigned two students in my Housing Rights Clinic a fairly complex judicial review case at the beginning of the semester. The case concerned a tenant in a rent-regulated apartment who was forced to move from her home after a fire. Pursuant to an administrative rule, the tenant's rent was reduced to \$1.00. After a year, when the landlord had not completed the repairs to the apartment, the tenant had nowhere else to live and moved back into the apartment. She continued to pay \$1.00 rent. The landlord filed an application with the agency to restore the pre-fire rent, but the agency administrator de-

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\* Professor of Law, Hofstra University. B.A., University of Chicago; J.D., University of Illinois. I wish to thank John De Witt Gregory, David R. Kaufman, Lawrence W. Kessler, Gary H. Palm, and Vimla L. Patel for their assistance on this manuscript. I especially wish to express my appreciation to Richard K. Neumann, Jr., who introduced me to the writings of Mihaly Csikszentmihalyi. I also wish to give my gratitude to my research assistants Monica Renee Austin, Elizabeth Quinn, Teresa Staples, and Steven Wilkins for their help in preparation of this article. Finally, I would like to thank Hofstra University for providing me with the research support that made this article possible. <sup>9</sup>

nied the request, finding that all the repairs had not been made. The landlord appealed this decision to the agency's commissioner. Over a year-and-a-half later, while this appeal was still pending, the landlord sold the property to another company, and this company filed a non-payment eviction action against the tenant. That action was settled by a stipulation under which the new landlord agreed to make repairs, the tenant agreed to begin paying full rent, and the new landlord waived all rent then due. This new landlord then sold the property to the present landlord.

A year later – almost two years after the original landlord had appealed to the commissioner – the commissioner reversed the administrator's order and held that the pre-fire rent should have been restored once the tenant moved back into the apartment. The present landlord then served a demand on the tenant for approximately \$16,000 in rent it alleged was owing under the commissioner's order. At this point, the tenant, who had been proceeding *pro se* in the agency, sought help from the Clinic.

My Housing Rights Clinic is a one-semester, six credit course, and the students I assigned the case were in their last semester of law school. They were well above-average students: one was a law review editor and the other had extensive experience interning for a judge. By the time they received the case, the student from the prior semester had conducted substantial legal research and filed the initial pleading instituting a judicial review proceeding in the trial court; the agency had filed its brief; the original landlord (which had sold the property two years previously) had filed a motion to intervene in the case; and the present landlord had filed an eviction case in a lower court because the tenant had not paid the past-due \$16,000. The students faced a three-and-a-half week deadline for filing the reply to the agency's brief.

I viewed the case as a treasure trove of interesting procedural and substantive legal questions and challenging lawyer/client relationship issues. Procedurally, the case posed questions about the authority of the commissioner to override the decision of the administrator; the powers of the trial court in reviewing an agency decision; the right of the previous landlord to intervene; and the interplay between the judicial review and eviction cases. Substantively, the case raised issues about the commissioner's construction of the relevant administrative rules; the evidentiary support in the administrative record for the decision; the rights – under the lease, the administrative rules, and the common law – of the predecessor and successor landlords to any rent owing under the commissioner's order; and the effect of the second landlord's waiver of rent on any rights to rent of the original and pre-

sent landlords. And in terms of client relationship issues, the case raised difficult issues of counseling a very distrustful client. The client had quite successfully waged a battle on her own against three different landlords for over three years, and was quite bewildered that she now faced a \$16,000 judgment with only a minimum-wage income. She felt very angry that her fate was in the hands of third-year law students.

The students delved into the case with great enthusiasm, mastering the file very quickly, immediately contacting the client, and plunging into legal research. But, almost from the beginning, I discovered that I had to provide substantial direction both in terms of legal research and client counseling. The students simply did not have the necessary knowledge of administrative law, judicial review, intervention doctrine, or court rules to develop strong procedural arguments. And although their first-year courses had given them some background on the issues of waiver, rights of predecessor and successor landlords, and statutory and lease construction, they still had difficulty remembering what they learned in those classes and connecting it with this particular case. I found myself teaching mini-seminars on most of the issues and assigning specific research assignments. In regard to client counseling, while the students tried to develop a good relationship with the client, she became even more distrustful of them when they could not quickly answer her questions about the procedural posture of the case and the substantive issues in the case. Even with the drafting of the brief, the students had difficulty. Both of them were excellent writers, but the challenge raised by their lack of knowledge of the legal issues not only slowed the process but made it difficult for them to formulate cogent arguments. I eventually had to revise much of the students' draft.

When the final draft was complete, I congratulated them on their efforts and asked them to file the brief and draft a proof of service. I was stunned by the response. They both responded, "What's a proof of service?" And at that moment, I recognized the limitations of this particular case as a vehicle for teaching legal problem solving. I had spent three weeks in sessions with the students discussing fairly complex theories of administrative law and judicial review, the basics of waiver doctrine, and different methods for counseling a distrustful client. But when it came to the simple task of filing their work product properly with the court, they not only did not understand the concept of "proof of service," but had no idea how to even engage in the basic problem solving of determining its meaning. While the students were lively participants in the case discussions, for the most part, the learning was as passive as in many law school courses. It struck me that the

difficulty of tackling the basic doctrinal issues in the case made it unlikely that the students learned much from this experience about problem solving in future cases.<sup>1</sup>

From this and other similar experiences, I have begun to explore the issue of the relationship between a student's knowledge of the underlying legal doctrine in cases and her ability to learn effective methods of practice in a law school setting. One of the primary goals of skills training in law school, especially clinical legal education, is to teach students how to apply what they have learned in doctrinal courses in the "real world."<sup>2</sup> While much has been written about training students in proper methods of practice and problem solving in skills courses,<sup>3</sup> little attention has been paid to the significance of doctrinal knowledge to this training: the corpus of legal knowledge, if any, that is necessary for such effective problem solving; the effects of limited doctrinal knowledge on the process of skills training; the implica-

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<sup>1</sup> That is not to say that the students' work on this case was a total failure as a learning experience. I believe that the students did learn something about the particular legal theories involved through our discussions and their research of these issues. And certainly there probably is an educational value to the students' experience of observing the crafting of a brief, even if they are not the primary creators of the final product. See generally Brook K. Baker, *Learning to Fish, Fishing to Learn: Guided Participation in the Interpersonal Ecology of Practice*, 6 CLIN. L. REV. 1 (1999). One of my primary pedagogical goals, however, is to have students learn problem-solving methods that they can eventually use in their practice. The students' experience with this case did not fulfill that goal.

While it can be argued that this kind of case with a short deadline is an anomaly for most housing clinics, many landlord/tenant disputes, by their very nature, involve fairly complex doctrinal issues. Although most jurisdictions do not have a rent regulation system, even "routine" eviction cases can raise difficult issues involving procedural requirements precedent to the summary proceeding; special service of process rules; agency theory; waiver and estoppel; lease and statutory construction; unconscionability; and common law covenants and warranties. Moreover, in most trial practice, a three-and-a-half week deadline for the filing of a brief in a judicial review proceeding is not unusual. See N.Y. C.P.L.R. 7804(c) (McKinney 1994).

<sup>2</sup> Maureen E. Laffin, *Toward the Making of Good Lawyers: How an Appellate Clinic Satisfies the Professional Objectives of the MacCrate Report*, 33 GONZ. L. REV. 1, 27 (1998); Steven Wizner, *The Law School Clinic: Legal Education in the Interests of Justice*, 70 FORDHAM L. REV. 1929, 1933 (2002).

<sup>3</sup> See, e.g., Mark Neal Aaronson, *We Ask You to Consider: Learning About Practical Judgment in Lawyering*, 4 CLIN. L. REV. 247 (1998); Janeen Kerper, *Creative Problem Solving vs. the Case Method: A Marvelous Adventure in which Winnie-the-Pooh Meets Mrs. Palsgraf*, 34 CAL. W. L. REV. 351 (1998); Alan M. Lerner, *Law & Lawyering in the Work Place: Building Better Lawyers by Teaching Students to Exercise Critical Judgment as Creative Problem Solvers*, 32 AKRON L. REV. 107 (1999); Linda Morton, *Legal Education: Teaching Creative Problem Solving: A Paradigmatic Approach*, 34 CAL. W. L. REV. 375 (1998); Richard K. Neumann, Jr., *Donald Schön, the Reflective Practitioner, and the Comparative Failures of Legal Education*, 6 CLIN. L. REV. 401 (2000); Kimberly E. O'Leary, *Using "Difference Analysis" to Teach Problem-Solving*, 4 CLIN. L. REV. 65 (1997); Barbara Stark, *The Practice of Law As Play*, 30 GA. L. REV. 1005 (1996); Graham B. Strong, *The Lawyer's Left Hand: Nonanalytical Thought in the Practice of Law*, 69 U. COLO. L. REV. 759 (1998).

tions of the need for an adequate doctrinal foundation to the sequencing of courses in law school curriculum; case and problem selection in skills courses; and the demands made on students in these courses to understand complex legal doctrine.

Cognitive psychologists posit that there are two important ways to characterize the knowledge essential to the effective performance of a task: (1) "domain knowledge," explicit knowledge of the concepts, principles, and structures of thinking about the particular domain in which the problem arises; and (2) tacit knowledge that cannot be made verbal that involves how to do things.<sup>4</sup> Explicit knowledge and tacit knowledge, they claim, are two separate forms of knowledge, which are effected by different mechanisms and acquired through different experiences.<sup>5</sup> Understanding the interplay between these two types of knowledge, they argue, is essential to comprehending how professionals learn to practice and solve problems effectively.<sup>6</sup>

In contrast to the field of legal education, in which very little consideration has been given to the relationship between domain knowledge and practice,<sup>7</sup> researchers in other areas of professional training have begun to study this issue. Research has been conducted, for example, on the role of domain knowledge in creative problem solving in the fields of accounting<sup>8</sup> and financial planning.<sup>9</sup> And a number of

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<sup>4</sup> Vimla L. Patel, José F. Arocha & David R. Kaufman, *Expertise and Tacit Knowledge in Medicine*, in *TACIT KNOWLEDGE IN PROFESSIONAL PRACTICE* 75, 77-78 (Robert H. Sternberg and Joseph A. Horvath, eds. 1999); Dennis J. Devine & Steve W.J. Kozlowski, *Domain-Specific Knowledge and Task Characteristics in Decision Making*, 64 *ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES* 294 (1995) (distinguishing between "declarative" and "procedural" knowledge). While the term "domain knowledge" does not always have a precise meaning in the cognitive psychology literature, for purposes of this paper, I use the definition in the text to differentiate it from the tacit knowledge used to apply such knowledge in practice.

<sup>5</sup> Patel et al., *supra* note 4, at 75-76.

<sup>6</sup> *Id.* at 79.

<sup>7</sup> One of the few articles which addresses the issue identifies the distinction between explicit and tacit knowledge in the field of law, but provides little insight into the specific interplay between domain knowledge and the practice of law. It merely concludes that, "Knowing the detail of the law is not enough to make a legal expert." Garry Marchant & John Robinson, *Is Knowing the Tax Code All It Takes to be A Tax Expert? On the Development of Legal Expertise*, in *TACIT KNOWLEDGE IN PROFESSIONAL PRACTICE*, *supra* note 4, at 3, 17.

<sup>8</sup> G. Marchant, John Robinson, Urton Anderson & Michael Schadowold, *Analogical Transfer & Expertise in Legal Reasoning*, 48 *ORGANIZATIONAL BEH. & HUM. DECISION PROCESSES* 272 (1991).

<sup>9</sup> Douglas A. Hershey, David A. Walsh, Stephen J. Read & Ada S. Chulef, *The Effects of Expertise on Financial Problem Solving: Evidence for Goal-Directed, Problem-Solving Scripts*, 46 *ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES* 77 (1990). Substantial other research has been conducted on the effects of domain knowledge on problem solving in contexts other than professional development. See generally Jennifer Wiley, *Expertise As Mental Set: The Effects of Domain Knowledge in Creative Problem Solving*, 26 *MEMORY & COGNITION* 716, 716-18 (1998) (reviewing studies on areas ranging from chess

studies have been performed on this issue in the field of medical education for more than a decade, particularly by Vimla Patel and her associates at McGill University's Centre for Medical Education.<sup>10</sup> While these researchers are far from unanimous in positing the precise function of domain knowledge in professional practice, they have developed some helpful tentative theories on this issue.

The purpose of this article is to explore the psychological research on the relationship of domain knowledge and problem-solving in practice, to apply it to an understanding of the role of doctrinal knowledge in the practice of law, and to consider the implications of this research on the training of law students in skills and clinical courses. This article will first examine how recent legal scholarship on problem solving in practice considers the role of legal doctrine in the training process. It will then review psychological research in the areas of creativity training, problem solving, learning theory, and cognitive development to determine the present understanding of the relationship between domain knowledge and the ability to problem solve in practice. Then it will address the implications of this research for the training of professionals with special attention to the education of medical students. In light of this research, this article will then critique the current clinical literature on legal problem solving. Finally, this article will propose some curricular changes in skills and clinical

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to baseball expertise).

<sup>10</sup> See, e.g., David R. Kaufman & Vimla L. Patel, *The Nature of Expertise in the Clinical Interview: Interactive Medical Problem Solving*, in PROCEEDINGS OF THE TENTH ANNUAL CONFERENCE OF THE COGNITIVE SCIENCE SOCIETY 461 (1988); Vimla L. Patel, David R. Kaufman & José F. Arocha, *Conceptual Change in the Biomedical and Health Sciences Domain*, in ADVANCES IN INSTRUCTIONAL PSYCHOLOGY (Robert Glasser ed., 2000) [hereinafter Patel et al., *Conceptual Change*]; Vimla L. Patel et al., supra note 4, at 75; Vimla Patel & David R. Kaufman, *Clinical Reasoning & Biomedical Knowledge: Implications for Teaching*, in CLINICAL REASONING IN THE HEALTH PROFESSIONS 117 (Joy Higgs & Mark Jones, eds. 1995); Vimla L. Patel & Guy J. Groen, *The General & Specific Nature of Medical Expertise: A Critical Look*, in TOWARD A GENERAL THEORY OF EXPERTISE 93 (K. Anders Ericsson & Jacqui Smith, eds. 1991) [hereinafter Patel & Groen *General & Specific Nature*]; José F. Arocha & Vimla L. Patel, *Novice Diagnostic Reasoning in Medicine: Accounting for Evidence*, 4 J. OF LEARNING SCI. 355 (1995); Henry P.A. Boshuizen & Henk G. Schmidt, *On the Role of Biomedical Knowledge in Clinical Reasoning by Experts, Intermediates and Novices*, 16 COGNITIVE SCI. 153 (1992); Vimla Patel, Guy J. Groen & Geoffrey R. Norman, *Reasoning and Instruction in Medical Curricula*, 10 COGNITION & INSTRUCTION 335 (1993) [hereinafter Patel et al., *Reasoning & Instruction*]; Vimla L. Patel & Guy J. Groen, *Developmental Accounts of the Transition from Medical Student to Doctor: Some Problems and Suggestions* 25 MED. ED. 527 (1991) [hereinafter Patel & Groen, *Developmental Accounts*]; Vimla Patel, Guy J. Groen & Geoffrey R. Norman, *Effects of Conventional and Problem-Based Medical Curricula on Problem Solving*, 66 ACADEMIC MED. 380 (1991) [hereinafter Patel et al., *Effects of Conventional and Problem-Based Curricula*]; Vimla L. Patel, Guy J. Groen & José F. Arocha, *Medical Expertise As A Function of Task Difficulty*, 18 MEMORY AND COGNITION 394 (1990) [hereinafter Patel et al., *Medical Expertise*].

programs to take into account the role that legal doctrine performs in learning effective methods of legal practice.

The basic thesis of this article is that, consistent with the findings in recent psychological studies, especially those in the field of medical training, knowledge of substantive legal doctrine does have a significant function in learning effective legal practice, and that skills law teachers, for the most part, have incorrectly downplayed that role.

Although some might argue that studies in fields such as medicine are not relevant to legal practice, the differences between learning medical and legal practice are not that substantial. Medical knowledge consists of two different kinds of knowledge: basic sciences (such as biochemistry, anatomy, and physiology) and clinical knowledge (learning which comes from applying basic scientific knowledge to the treatment of patients in particular situations).<sup>11</sup> Clinical knowledge is not simply “hard science”:

In hard science, the usual motive is inquiring: to gain a new understanding of some mechanism of nature. . . . In contrast, the care and treatment of the individual patient is the ultimate, specific act that characterizes a clinical physician. . . . The clinical physician, therefore, must take account of the immediacy of the problem confronting her for she bears an essential relationship to each patient. Additionally, she has many human values to consider – ethics, compassion, and . . . a willingness to take responsibility in the face of the unknown.<sup>12</sup>

Similarly, legal knowledge has two different aspects: basic knowledge of legal doctrine and principles (such as torts, contracts, property law, and principles of legal reasoning) and clinical knowledge (learning derived from applying these doctrines in representing clients in particular situations).<sup>13</sup> The legal practitioner, unlike the law professor, has to apply those doctrines in the context of a particular client in a specific set of circumstances.<sup>14</sup>

Because lawyers and doctors apply their knowledge in actual situations, the legal and medical domains are what cognitive psychologists call “ill-structured”:

- (1) [t]he place to begin to define the problem is usually not clear;
- (2) there often are many contingencies to take into account; (3) how

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<sup>11</sup> Patel & Groen, *The General & Specific Nature*, *supra* note 10, at 120; Patel & Kaufman, *supra* note 10, at 118.

<sup>12</sup> *Moore v. Ashland Chemical*, 126 F.3d 679, 688 (5th Cir. 1997), *overruled on other grounds* 151 F.3d 269 (5th Cir. 1998) (en banc) (citations omitted).

<sup>13</sup> See KARL L. LLEWELLYN, *THE COMMON LAW TRADITION: DECIDING APPEALS* 201-203 (1960).

<sup>14</sup> Llewellyn called this application of legal doctrine in practice, “situation-sense.” *Id.* at 121-26. See generally Aaronson, *supra* note 3, at 254-55.



to weigh and assess the various interdependent variables is uncertain; (4) one has to continuously reframe and reconsider what one is doing in light of new information and shifting calculations; and (5) the goals to be sought are frequently subject to debate and refinement and are not usually susceptible to clear measurement.<sup>15</sup>

Resolution of such problems requires the use of both doctrinal and clinical knowledge. Obviously, however, depending on the problem's complexity, both legal and medical problems can span the spectrum from minimally to very ill-structured.

The distinction between doctrinal and clinical knowledge has been an important topic of debate in medical as well as legal education. Under the traditional medical school curriculum, students initially learned the basic sciences and considered simple clinical problems in the context of idealized presentations in textbooks and lectures. Clinical knowledge of how to deal with complex cases was often learned in an unsystematic way by exposure to patients in hospitals.<sup>16</sup> This approach has been criticized by those who assert that basic science is irrelevant to the future needs of practitioners. They argue that, "[m]edical education should not be designed to develop scientists nor students who are encyclopedias of scientific trivia, no matter how vital that trivia might be in the pursuit of pure science."<sup>17</sup> Similarly, in legal education the profession has engaged in a debate over the importance of traditional doctrinal education versus an emphasis on skills training. Echoing the sentiments of their counterparts in medical education, some legal educators argue that, "Ours has thus become an educational system with the capacity to train highly

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<sup>15</sup> Aaronson, *supra* note 3, at 257 (observing "most perplexing and interesting lawyering situations involve what cognitive scientists would refer to as ill-structured problems"); Ian Weinstein, *Lawyering in the State of Nature: Instinct and Automaticity in Legal Problem Solving*, 23 VT. L. REV. 1, 9 (1998); Kaufman & Patel, *supra* note 10, at 462 (noting "[m]edical problem solving has been described as an ill-structured task . . . in which . . . the goal state and the necessary constraints, are unknown at the beginning of the problem-solving process").

Obviously, some medical problems are not ill-structured. A physician may treat a patient with obvious symptoms who needs a routine regimen of care. In those situations, the problem-solving process will not require careful assessment of alternative diagnoses, and recovery will be subject to susceptible measurement. By the same token, however, not all legal problems are ill-structured. A lawyer representing a client in the purchase of a home will not need to use the same process as she might perform for a transaction involving a large-scale housing development. The important point is that ill-structured problems arise in both the medical and legal settings; medicine is not simply the mechanical application of basic scientific knowledge.

<sup>16</sup> Arocha & Patel, *supra* note 10, at 380.

<sup>17</sup> Patel & Kaufman, *supra* note 10, at 118; Patel, et al., *Conceptual Change*, *supra* note 10, at 335-36 ("[T]he issue of where to shift the balance [between medicine as science and medicine as a profession] has been the source of considerable controversy in medical education for most of this century.").

accomplished law clerks, legal scholars, law review editors, and appellate advocates, but a system less well designed to train other kinds of lawyers.”<sup>18</sup>

Although the issue of domain and clinical knowledge exists in both the medical and legal professions, some might argue that studies of medical practice are still not applicable to the understanding of legal problem solving because the “effectiveness” of medical treatment can be empirically verified much more accurately than the “effectiveness” of legal representation. In medicine, the effectiveness of a diagnosis and treatment plan for a particular patient can be assessed by examination of the patient.<sup>19</sup> The legal environment, however, provides only limited opportunities for gauging objectively the effectiveness of a particular strategy or argument. Most legal arguments, for example, never reach a court which could be the final arbiter of their strength or weakness.<sup>20</sup>

Even though legal practice, unlike medicine, often lacks the opportunity for objective measurement of efficacy, there are standards for assessing effectiveness of legal problem-solving. The most obvious gauge is the stated objective of the client. Under traditional ethical rules, the success or failure of a legal course of action, argument or strategy requires an examination of the client’s goals in the situation, not necessarily the judgment of a court or other third-party arbiter.<sup>21</sup> The effectiveness of a lawyer’s problem-solving, then, can be measured by focusing on the client’s interests in a case, just as a physician’s success in treating a patient can be assessed by examining the needs of the patient.<sup>22</sup>

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<sup>18</sup> Gary L. Blasi, *What Lawyers Know: Lawyering Expertise, Cognitive Science, and the Functions of Theory*, 45 J. LEGAL EDUC. 313, 315 (1995).

<sup>19</sup> See generally Patel et al., *Conceptual Change*, *supra* note 10, at 329. Even if a patient’s condition becomes better, however, the reason for this improvement is not always clear. To that extent, the difference between law and medicine may be less than usually suggested.

<sup>20</sup> Marchant & Robinson, *supra* note 7, at 16. Likewise, in medicine, even wrong diagnoses and wrong therapies still may lead to patient improvement. Moreover, unless a patient dies or becomes severely impaired, most medical decisions never come before a final arbiter.

<sup>21</sup> See MODEL CODE OF PROF’L RESPONSIBILITY DR 7-101(A)(1)(1980) (“A lawyer shall not intentionally [f]ail to seek the lawful objectives of his client through reasonably available means permitted by law . . . .”); MODEL RULES OF PROF’L CONDUCT R. 1.2(a) (1983) (“A lawyer shall abide by a client’s decision concerning the objectives of the representation . . . and shall consult with the client as to the means by which they are to be pursued.”).

<sup>22</sup> Surprisingly, some of the literature on legal problem-solving ignores the issue of client goals. In one recent article, for example, the author describes a case where all African-American first-grade students in an elementary school were assigned to the only African-American first-grade teacher. Parents complained, and litigation was threatened. A lawsuit was averted when an African-American school board member proposed a solution

## I. THE ATTITUDE TOWARD DOMAIN KNOWLEDGE IN RECENT LEGAL PROBLEM-SOLVING SCHOLARSHIP

Before examining the role that cognitive psychologists have discovered that domain knowledge plays in professional problem-solving, it is helpful to review the recent scholarship on teaching legal problem-solving so that a comparison can be made between the theories advanced in that literature and the findings in the psychological studies. For the most part, this legal scholarship is based on the personal experiences of the authors as skills or clinical teachers and not on empirical studies in the law school setting.<sup>23</sup> Moreover, the theoretical bases for much of this literature are psychological theories that do not empirically consider the role of domain knowledge in the problem-solving process.<sup>24</sup> While such deficiencies do not totally undermine the approaches urged by these scholars, they do raise the issue of whether these authors have considered adequately the role that legal doctrine plays in training lawyers to be effective problem solvers.

The major theme of most of the recent scholarship on teaching legal problem solving is that law schools focus too narrowly on legal doctrine as the basis for devising solutions to clients' problems. As one commentator has argued,

Traditional law school methods emphasize the study of appellate cases, rules, statutes, and the procedures of the adversary method. The lawyer's perceived role is to vindicate the client's individual interests. Conflict is viewed as a zero-sum game with rights and liabilities, and winners and losers. Advocacy and assertiveness are seen as important skills.

. . . .

Underlying the case method is a set of tacit assumptions which

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maintaining the assigned classrooms but providing for joint activities among the classes. Lerner, *supra* note 3, at 107. The author lauds the resolution as creative problem-solving arguing that the case had "enormous potential to degenerate into litigation that might have destroyed the community." *Id.* He bemoans the fact that, "none of the lawyers for any of the interested parties had proposed a solution other than to which their clients were entitled." *Id.* at 108. While Lerner's assessment of the lawyers' representation may be correct if the proposed solution in fact did meet their client's interests, he fails to address the issue of whether the resolution did in fact meet those interests. As a policy matter, the averting of a lawsuit may have been a benefit to the community and saved judicial resources. As a legal representation matter, however, some African-American parents may have wanted a public hearing of the issue and a definitive precedent barring such class assignments in the future. A lawyer representing such parents would not be engaged in effective problem-solving if she proposed the compromise solution without her client's consent.

<sup>23</sup> See, e.g., Aaronson, *supra* note 3; Baker, *supra* note 1; Lerner, *supra* note 3; But see Weinstein, *supra* note 15 (comparing how experienced practitioners and law students handled a Social Security Disability case).

<sup>24</sup> See, e.g., James M. Cooper, *Towards a New Architecture: Creative Problem Solving & the Evolution of Law*, 34 CAL. W. L. REV. 297 (1998); Neumann, *supra* note 3; Strong, *supra* note 3.

significantly constrain the options a lawyer may consider in attempting to resolve a client's problem. Chief among these is the implicit model of an adversary system based on rights and liabilities. Reasoning and decision making are seen as rule-based, in marked contrast to relational reasoning.<sup>25</sup>

This rule-based approach to problem solving, these scholars contend, is too mechanical and distracts students from an examination of how legal problems are actually resolved.<sup>26</sup> Moreover, they argue, it teaches students to become "gladiators," fixated on purely adversarial solutions to problems.<sup>27</sup> Indeed, they even criticize the MacCrate Report, the ABA study promoting increased stress on problem-solving skills in law schools,<sup>28</sup> because it "place[s] too much emphasis on problem solving in the context of client-driven representation by individual lawyers."<sup>29</sup>

Because of this misplaced focus on legal doctrine as the primary tool for problem solving, these scholars assert, legal education ignores the emotional and relational components of the lawyering process. One commentator, for example, writes that the "[a]bstract analysis [of traditional legal doctrine] reduces complexity by ignoring a portion of it. . . . Judgments of emotion . . . involve the integration of information from a wide variety of different sources and therefore may provide an ideal example of holistic or integrative perceptual process."<sup>30</sup> Rather than concentrating on the rights and liabilities of the positions of the parties, these scholars assert, law schools should focus on the emotions, needs and interests of the parties to facilitate positive social relations between clients and the other parties.<sup>31</sup> As a result, they argue, lawyers should be trained in methods for avoiding or prevent-

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<sup>25</sup> Kerper, *supra* note 3, at 353, 355 (1998).

<sup>26</sup> Thomas D. Barton, *Creative Problem Solving: Purpose, Meaning & Values*, 34 CAL. W. L. REV. 273, 283-85 (1998) ("The common law tends to approach human problems with a flattened vision of humanity."); Neumann, *supra* note 3, at 404 ("In all professions, the research emphasis on 'technical rationality' distracts everyone from an examination of how professional problems are actually solved.").

<sup>27</sup> Lerner, *supra* note 3, at 112; Barton, *supra* note 26, at 283-84 ("The common law tends to approach human problems with a flattened vision of humanity by defining problems as exclusively involving adversarial contests of rights.").

<sup>28</sup> SECTION ON LEGAL EDUC. & ADMISSIONS TO THE BAR, A.B.A., *LEGAL EDUCATION AND PROFESSIONAL DEVELOPMENT – AN EDUCATIONAL CONTINUUM* (Report of the Task Force on Law Schools and the Profession: Narrowing the Gap 1992).

<sup>29</sup> Morton, *supra* note 3, at 377. See generally Carrie Menkel-Meadow, *Narrowing the Gap by Narrowing the Field: What's Missing from the MacCrate Report – Of Skills, Legal Science, & Being A Human Being*, 69 WASH. L. REV. 593 (1994).

<sup>30</sup> Strong, *supra* note 3, at 776-77.

<sup>31</sup> Barton, *supra* note 26, at 278 ("Tools for solving human problems are . . . ethically constrained by an underlying respect for individuals and their relationships."); Cooper, *supra* note 24, at 306; Morton, *supra* note 3, at 377.

ing conflict rather than encouraging it.<sup>32</sup>

In a similar vein, some of this recent scholarship criticizes law school's focus on legal doctrine because it ignores the social and political context of people's problems. As one writer argues,

To achieve the levels of uniformity of process and results demanded by Enlightened legal method, the inputs of the legal machine must themselves be simplified and regularized. Hence, the human beings who bring the disputes to the legal system cannot be regarded with particularity or nuance. To maintain the neutrality and universal rationality of legal process, the people behind the dispute must be abstracted – consigned to a rather deep background. Only the overt behaviors of people (and occasionally their “intentions”) are considered important to the legal system. Humanity, with much pounded out except behavior and intention, can then be fed through legal rules for decisional processing, done impersonally and uniformly.<sup>33</sup>

As a result, the traditional method, such commentators assert, ignore the voices of those who have historically been disadvantaged.<sup>34</sup>

Finally, these scholars contend, legal education's emphasis on doctrinal solutions stifles flexible and creative thinking. They note that human interactions are not subject to mechanical rules, and that “[t]he crisp, clean-edged solutions of logic games may not be available to the law as it attempts to regulate the incidents of social relationships that are not wholly voluntary, and concerning aspects of life for which there are no simple empirical truths.”<sup>35</sup> Fixation on legal doctrine, they assert, encourages instrumental, inflexible approaches to problem-solving that ignore the human context of legal cases.<sup>36</sup> In contrast, creative legal problem solving, these scholars argue, requires investigation into disciplines other than the law,<sup>37</sup> attempts to see the

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<sup>32</sup> Kerper, *supra* note 3, at 354 (“One of the most significant aspects of the lawyer's role is assisting the client in building, maintaining, and strengthening positive relationships with others to avoid or prevent conflict.”); Linda Morton, *Legal Education: Teaching Creative Problem Solving: A Paradigmatic Approach*, 34 CAL. W. L. REV. 375, 377 (1998).

<sup>33</sup> See, e.g., Barton, *supra* note 26, at 285 (footnote omitted).

<sup>34</sup> See, e.g., *id.* at 288; Martha L. Minow, *Breaking the Law: Lawyers & Clients in Struggles for Social Change*, 52 U. PITT. L. REV. 723, 730-33 (1991).

<sup>35</sup> See, e.g., Barton, *supra* note 26, at 283.

<sup>36</sup> See, e.g., *id.* at 273, 284. As Professor Barton notes, “Too often . . . problems have been defined exclusively by the procedures contemplated to solve the problem. *Id.* at 293. See also Janet Weinstein & Linda Morton, *Stuck in a Rut: The Role of Creative Thinking Problem Solving and Legal Education*, 9 CLIN. L. REV. 835, 841 (2003) (“[A] lawyer too mired in legal reasoning may examine a personal injury case only from a legal point of view: are there sufficient duty, breach, cause, and damages. A more expansive and useful analysis would examine the case from the perspective of other disciplines, such as medicine, psychology, and business.”).

<sup>37</sup> Morton, *supra* note 3, at 377-78.

“whole picture,” not just the position of the clients,<sup>38</sup> self-conscious reflection,<sup>39</sup> and seeks to broaden the imagination beyond obvious solutions.<sup>40</sup>

To remedy what these scholars consider to be an undue emphasis on legal doctrine in law school education, they propose a variety of changes to the standard curriculum. Some commentators recommend that law schools educate students to “dig into the real motivations of each client” so that they can consider ways of resolving her problems by methods other than traditional legal remedies.<sup>41</sup> Similarly, they urge law teachers to train their students to “think outside the box”: to learn methods of creative and critical thinking and to use insights from other disciplines to devise solutions to problems.<sup>42</sup> Others propose

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<sup>38</sup> Aaronson, *supra* note 3, at 251-52 (“One critical attribute shared by those whom I regarded as good lawyers was their ability to see the whole situation – both the big picture and the particular details. They also tended to have an accompanying strong sense – almost an immediate sense – of what the danger points were and what were the likely options and potential consequences of different courses of action. Furthermore, those lawyers whom I admired seemed comfortable in taking into account and articulating rather quickly the likely viewpoints and concerns of different participants.”).

<sup>39</sup> Morton, *supra* note 3, at 377.

<sup>40</sup> Stark, *supra* note 3, at 1016-18.

<sup>41</sup> See, e.g., Cooper, *supra* note 24, at 317; Morton, *supra* note 3, at 375. One writer, for examples, relates:

My short-term goal in teaching a creative problem solving component in my classes is to engage students in thinking processes in addition to that of legal analysis,

. . . .

The problem I have used [in a clinical course] is based on an actual case. A woman went inside a shoe store to return a pair of shoes which had broken the first day she wore them. She explained to the manager that she had taken the shoes to a shoe repair person, who explained to her that the shoes should not have broken as they did. She asked the manager for another pair of the same style of shoes, a refund, or a store credit. The manager refused. When the woman complained of the store's service to another customer, the manager came up to the complaining woman, put his hand on her back, opened the door to the outside, and gently pushed her out.

After narrating the story to my students, I ask them about their current thoughts. Consistently, their immediate focus is the store's liability, and the patron's possible causes of action. But, after discussing each phase of the model in the context of the hypothetical, the class comes to a different conclusion. First, students identify and attempt to understand the problem . . . . What are the client's real interests? . . . Who are the stakeholders? Is the problem part of a larger issue? What societal interests might be involved? How, if at all, could the problem have been prevented?

*Id.* at 384-85.

<sup>42</sup> See, e.g., Mark Neal Aaronson, *Thinking Like a Fox: Four Overlapping Domains of Good Lawyering*, 9 CLIN. L. REV. 1, 18 (2002); Cooper, *supra* note 24, at 317; Laurie Morin & Louise Howells, *The Reflective Judgment Project*, 9 CLINICAL L. REV. 623, 628 (2003) (arguing that “[t]he creative problem solving model recognizes that human problems rarely require only a legal solution, and that not all legal problems should result in a lawsuit and adversarial positioning.”); Morton, *supra* note 3, at 377-78 (1998); Neumann, *supra* note 3, at 418.

the use of more “play” techniques – role playing and clinical work in the “real” community – to assist students in the “massive integration of doctrine and its application[s].”<sup>43</sup> Still others suggest that law schools teach students to be sensitive to human differences so that they can help their clients develop solutions which promote positive relationships.<sup>44</sup>

Although this scholarship faults legal education for its concentration on doctrinal solutions, it does recognize – usually grudgingly — that legal doctrine plays some function in the lawyering process and the training of law students. Typically, authors will include in their criticism of legal education passages such as, “The case method should be only one tool in the lawyer’s tool box”;<sup>45</sup> “[t]he effective advocate, like the able architect, knows but is not inflexibly constrained by doctrine”;<sup>46</sup> “[a]lthough we might agree that law school is an important, perhaps even essential, step in learning certain conventions of analysis and argumentation, . . . [a]ny reasonable view of enculturation [to the legal profession] would permit, even encourage, exposure to other legal actors besides law professors.”<sup>47</sup> These writers are silent, however, on the issues of the amount of training in doctrine that is necessary to be able to use it as a tool or the precise relationship between domain knowledge and their “creative problem-solving” methods.<sup>48</sup>

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<sup>43</sup> Stark, *supra* note 3, at 1010-14.

<sup>44</sup> See Barton, *supra* note 26, at 288 (urging the teaching of creative problem solving methods which “seek[ ] on a pragmatic basis to advance the values of inclusiveness, decentralized decision making, and respect for both human differences and the bonds of non-coercive relationships”).

<sup>45</sup> Kerper, *supra* note 3, at 355.

<sup>46</sup> John Nivala, *An Architecture for Advocacy: A Sense of the Whole*, 17 J. LEGAL PROF. 19, 43 (1992).

<sup>47</sup> Baker, *supra* note 1, at 25 n.91. See also Morin & Howells, *supra* note 42, at 644 (in advocating a “reflective judgment” model for clinics, authors state, “[w]e assume that knowledge base and related experience are essential factors in the ability to engage in effective reflection on complex client matters.”).

<sup>48</sup> Any discussion of the relationship between doctrinal knowledge and problem-solving usually addresses training students in methods they should not use. One commentator, for example, argues, “Should we toss out the case method entirely? Definitely not. The study of litigated disputes not only teaches the rules of law, but provides the reasoning to show how and why the cases were won. *Preventive law cannot be properly practiced until the practitioner knows what must be prevented.*” Kerper, *supra* note 3, at 370-71 (1998) (emphasis added).

## II. COGNITIVE PSYCHOLOGY RESEARCH ON THE RELATIONSHIP BETWEEN DOMAIN KNOWLEDGE AND CREATIVE PROBLEM SOLVING

### A. *Nature of Studies on the Relationship of Domain Knowledge and Ability to Solve Problems*

As noted previously, the recent negative attitude toward doctrine in legal problem solving is not grounded in empirical studies or psychological theories on learning and performance that consider in-depth the relationship between domain knowledge and the ability to problem solve, but rather on personal experiences teaching law students. Accordingly, an accurate assessment of this attitude and the proposed curricular changes advocated by this scholarship requires an examination of psychological studies that do specifically focus on this relationship. These studies have been conducted in a number of distinct, but related areas.<sup>49</sup>

First, studies have been conducted on the role of domain knowledge in the creative process.<sup>50</sup> While much of the research in this field has focused on the production of the exceptional works of a Mozart, Michelangelo or Einstein,<sup>51</sup> other studies have considered the creative process in solving "everyday" problems.<sup>52</sup> Whichever type of process

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<sup>49</sup> An excellent general discussion of the implications of cognitive psychology research for legal education and problem solving is contained in Blasi, *supra* note 18. While Professor Blasi's essay, like the present article, recognizes the importance of structured knowledge to a professional's expertise, *id.* at 332-42, he does not address the issue of the limits of teaching law students problem solving without an adequate foundation in this structured knowledge.

<sup>50</sup> See generally TERESA M. AMABILE, *CREATIVITY IN CONTEXT* (1996); MIHALY CSIKSZENTMIHALYI, *CREATIVITY: FLOW & THE PSYCHOLOGY OF DISCOVERY & INVENTION* (1996) [hereinafter, CSIKSZENTMIHALYI, *CREATIVITY*]; MIHALY CSIKSZENTMIHALYI, *FLOW: THE PSYCHOLOGY OF OPTIMAL EXPERIENCE* (1990) [hereinafter, CSIKSZENTMIHALYI, *FLOW*]; DAVID HENRY FELDMAN, MIHALY CSIKSZENTMIHALYI, & HOWARD GARDNER, *CHANGING THE WORLD: A FRAMEWORK FOR THE STUDY OF CREATIVITY* (1993); Jerome Bruner, *The Conditions of Creativity*, in *CONTEMPORARY APPROACHES TO CREATIVE THINKING 1* (Howard Gruber, Glenn Terrell, and Michael Wertheimer, eds. 1962); Beth A. Hennessey & Theresa M. Amabile, *The Conditions of Creativity*, in *THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES 11* (Robert J. Sternberg, ed. 1988); Paul E. Tesluk, James L. Farr, & Stephanie R. Klein, *Influences of Organizational Culture & Climate on Individual Creativity*, 31 J. CREATIVE BEHAVIOR 27 (1997).

<sup>51</sup> See, e.g., CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50; BREWSTER GHISELIN, *THE CREATIVE PROCESS* (1952).

<sup>52</sup> Arthur J. Cropley, *Creativity and Cognition: Producing Effective Novelty?* 21 ROEPER REV. 253, 254 (1999). See, e.g., Maria M. Clapham, *Ideational Skills Training: A Key Element in Creativity Training Programs*, 10 CREATIVITY RES. J. 33 (1997); Maria Maciejczyk Clapham & Donald Schuster, *Can Engineering Students Be Trained To Think Creatively?* 26 J. CREATIVE BEHAVIOR 156 (1992); Robert W. Weisberg, *Problem Solving & Creativity*, in *THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES*, *supra* note 50, at 148. Indeed, some psychologists have argued that "the



is considered, most researchers rely on a product definition for creativity: "A product is viewed as creative to that extent that [expert observers consider] it both a novel response and an appropriate, useful, correct, or valuable response to an open-ended task."<sup>53</sup> Generally, the methodology for this research has focused either on personal observations or interviews with subjects about their process of creation<sup>54</sup> or the effectiveness of creativity training programs.<sup>55</sup>

A second set of studies has examined the relationship between domain knowledge and the development of expertise.<sup>56</sup> This research has considered expert knowledge in the context of both highly structured domains such as chess and other games,<sup>57</sup> as well as ill-structured domains such as decision making.<sup>58</sup> The concept of an expert "refers to an individual who surpasses competency in a domain. . . . A domain expert . . . possesses an extensive, accessible knowledge base that is organized for use in practice and is tuned to the particular problems at hand."<sup>59</sup> Consistent with this definition, researchers in this area usually delineate a progression of development from novice to expert. Vimla Patel, a prolific researcher on expertise in the medical profession, for example, has developed a detailed typology for the levels of expertise in that profession: layperson; beginner; novice; intermediate; subexpert; and expert.<sup>60</sup> Studies on expertise include comparative research on how novices and experts resolve hypothetical problems,<sup>61</sup> as well as observations of how subjects with differing levels of expertise perform in practice.<sup>62</sup>

A final area of research that addresses the role of domain knowledge in problem solving is cognitive load theory.<sup>63</sup> Psychologists have

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thought processes involved in the great creative acts are no different than those involved in the things we do everyday." *Id.* at 172.

<sup>53</sup> Hennessey & Amabile, *supra* note 50, at 14.

<sup>54</sup> See, e.g., CSIKSZENTMIHALYI, CREATIVITY, *supra* note 50 (study based on videotaped interviews with a group of ninety-one "exceptional" individuals).

<sup>55</sup> See, e.g., Maria M. Chapman, *Ideational Skills Training: A Key Element in Creativity Training Programs*, 10 CREATIVITY RES. J. 33 (1997).

<sup>56</sup> See, e.g., Wiley, *supra* note 9.

<sup>57</sup> See, e.g., *id.* (study of baseball knowledge). See generally Peter A. Frensch & Robert J. Sternberg, *Expertise and Intelligent Thinking: When Is It Worse to Know Better?* in 5 ADVANCES IN THE PSYCHOLOGY OF HUMAN INTELLIGENCE 157, 161 (1989).

<sup>58</sup> See *supra* note 15 and accompanying text.

<sup>59</sup> Patel et al., *supra* note 4, at 79.

<sup>60</sup> *Id.* at 80.

<sup>61</sup> See, e.g., Hershey et al., *supra* note 9 (in financial planning field subjects with varying experience decided whether a couple should open an Individual Retirement Account); Patel et al., *Reasoning and Instruction*, *supra* note 10 (medical students at differing levels of training diagnosed hypothetical patient).

<sup>62</sup> See, e.g., Kaufman & Patel, *supra* note 10 (physicians and medical students at differing levels of training diagnosed volunteer patient).

<sup>63</sup> See, e.g., Paul Chandler & John Sweller, *Cognitive Load and Format of Instruction*, 8

found that the nervous system has definite limits on the amount of information it can process at any given time.<sup>64</sup> Cognitive load theory is concerned with the manner in which different cognitive resources are used during learning and problem solving.<sup>65</sup> It posits that many learning and problem-solving procedures created to facilitate skills acquisition actually impede learning because they place too many cognitive demands on students.<sup>66</sup> Accordingly, cognitive load theorists submit that information should be presented to students in ways that do not impose a heavy extraneous cognitive load.<sup>67</sup> In the context of the issue addressed in this article, this theory raises significant questions about the possible cognitive overload when law students are required to learn both domain knowledge and problem-solving skills at the same time.

### *B. Domain Knowledge As A Prerequisite to Effective Problem Solving*

The Comment to Model Rule 1.1 of the American Bar Association's Model Rules of Professional Conduct on competency of representation states, in part,

A newly admitted lawyer can be as competent as a practitioner with long experience. Some important legal skills, such as the analysis of precedent, the evaluation of evidence and legal drafting, are required in all legal problems. Perhaps the most fundamental legal skill consists of determining what kind of legal problems a situation may involve, a skill that necessarily transcends any particular specialized knowledge. A lawyer can provide adequate representation in a wholly novel field through necessary study.<sup>68</sup>

As one attorney states in evaluating this comment,

This is a fudge, to be blunt. A lawyer who doesn't know the field will not be competent to analyze precedent, evaluate evidence, or draft documents; because the lawyer won't know what to look for, the critical precedent won't be understood, the critical piece of evidence will remain undisturbed in the files, and the terms of the document won't anticipate all that they should.<sup>69</sup>

This observation is firmly supported by the psychological research on creativity and expertise. A person must have an adequate

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COGNITION & INSTRUCTION 293 (1991).

<sup>64</sup> See CSIKSZENTMIHALYI, FLOW, *supra* note 50, at 28.

<sup>65</sup> Chandler & Sweller, *supra* note 63, at 294.

<sup>66</sup> *Id.*

<sup>67</sup> *Id.* at 295.

<sup>68</sup> MODEL RULES OF PROF'L CONDUCT R. 1.1 cmt. (1983).

<sup>69</sup> Edmund S. Spaeth, Jr., *What a Lawyer Needs to Learn*, in TACIT KNOWLEDGE IN PROFESSIONAL PRACTICE, *supra* note 4, at 21, 23.

grasp of domain knowledge to be a creative or expert problem solver in an area.<sup>70</sup> Obviously, a person needs to know music to write a symphony or must have a good grasp of nuclear physics to be creative in that field.<sup>71</sup> By the same token, in ordinary professional situations, a practitioner needs to acquire sufficient knowledge in a field to know how to frame the question, evaluate information, generate options, and execute a plan effectively.

Moreover, contrary to the implication of the comment to Model Rule 1.1 that most legal problem-solving legal skills – analysis of precedent, the evaluation of evidence, and legal drafting – are totally independent of domain knowledge of the particular field of law, much of the recent psychological research demonstrates context dependency of such skills. The issue addressed by this research is whether creativity is rooted in general, domain-transcending cognitive processes or whether it is “domain-specific.”<sup>72</sup> Although the jury is still out on the extent to which creativity is content specific, most studies suggest it is moderately but not completely domain specific.<sup>73</sup> While these findings give some support to the notion that certain lawyering skills transcend particular fields of law, they do not validate the suggestion of Model Rule 1.1 that these skills somehow predominate over doctrinal knowledge in the practice of law. The key issue, then, is determining the precise role played by domain knowledge in the lawyering process.

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<sup>70</sup> In regard to creativity studies, see generally CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50, at 90 (discussing creativity, author observes, “You cannot transform a domain unless you first thoroughly understand how it works”); Weisberg, *supra* note 52, at 155 (“[R]esearch indicates that rather than being independent of past experience, truly efficient problem solving comes about only when an individual has acquired a deep knowledge of the domain in question.”). In the field of expertise research, see generally Wiley, *supra* note 9, at 716 (“The possession of a large body of domain knowledge is central to expertise.”); James Shanteau, *Competence in Experts: The Role of Task Characteristics*, 53 *ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES* 252, 256 (1992) (“Having an adequate grasp of *domain knowledge* is obviously a prerequisite for being an expert.”).

<sup>71</sup> See AMABILE, *supra* note 50, at 86.

<sup>72</sup> See generally MARK A. RUNCO & STEVEN PRITZKER, *ENCYCLOPEDIA OF CREATIVITY* 292-94 (1999); John Baer, *The Case for Domain Specificity of Creativity*, 11 *CREATIVITY RES. J.* 173 (1998); Frensch & Sternberg, *supra* note 57, at 160. But see Jonathan A. Plucker, *Beware of Simple Conclusions: The Case for Content Generality of Creativity*, 11 *CREATIVITY RES. J.* 179 (1998).

<sup>73</sup> Todd I. Lubart, *Creativity*, in *THINKING & PROBLEM SOLVING* 289, 293-94 (Robert J. Steinberg, ed. 1994); Baer, *supra* note 72 (reviewing recent studies showing low correlations of creativity ratings in different areas (poetry, story-writing, mathematical puzzles, collages, and drawings)).

### C. Roles Played By Domain Knowledge in Effective Problem Solving

#### 1. Development of Problem-Solving Abilities

Recent psychological studies have rejected the simplistic notion that the sheer amount of a person's domain knowledge leads to more effective problem-solving in a field.<sup>74</sup> And they have also discarded as inadequate the view that expert problem-solving merely involves the application of powerful search algorithms to a broad knowledge store.<sup>75</sup> Experts in a particular area are not computers who merely apply general problem-solving methods to the learning they have collected. Finally, most researchers have dismissed as simplistic the theory that problem-solving is simply a process of pattern recognition based on domain knowledge and past experience.<sup>76</sup> They have concluded that it is not the amount of domain knowledge amassed, the ability to apply problem-solving methods to that knowledge, or the capacity to discover patterns similar to that knowledge that is crucial to expert problem-solving. Rather, it is the way that domain knowledge is organized.<sup>77</sup>

Most cognitive psychologists now hypothesize that expert reasoning involves accessing certain problem-solving *scripts* or *schemas* for handling particular problems.<sup>78</sup> These schemes, they hypothesize, structure experts' knowledge so they can gain quick and easy access to their memory and possible problem solutions.<sup>79</sup> Indeed, research studies have shown that when experts face a new problem, they spend significant time trying to assess the structure of the problem, presumably attempting to match the situation with known "solution paths."<sup>80</sup>

These schemes assist experts in reformulating problems to come to a solution. Cognitive psychologists theorize that expert problem-solving is an incremental process in which experts first recognize similarities between a given problem and their stored knowledge about past situations and then, when a proposed solution is found to be inadequate, reformulate the problem, attempt to retrieve additional infor-

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<sup>74</sup> See Devine & Kozlowski, *supra* note 4.

<sup>75</sup> See *id.* at 294 (discussing relationship of domain knowledge to expertise); AMABILE, *supra* note 50, at 87 (1996) (examining relationship of domain knowledge and creativity).

<sup>76</sup> See, e.g., Frensch & Sternberg, *supra* note 57, at 161; Patel & Groen, *General & Specific Nature*, *supra* note 10, at 115.

<sup>77</sup> See Frensch & Sternberg, *supra* note 57, at 161 (1989); Patel et al., *Conceptual Change*, *supra* note 10, at 335; Wiley, *supra* note 9, at 716.

<sup>78</sup> Hershey et al., *supra* note 9, at 80; Patel et al., *Conceptual Change*, *supra* note 10, at 335.

<sup>79</sup> See Hershey, et al., *supra* note 9, at 80; Wiley, *supra* note 9, at 716-17.

<sup>80</sup> See, e.g., Frensch & Sternberg, *supra* note 57, at 161.

mation, and try to identify other solutions.<sup>81</sup> Based on their domain knowledge, they disregard irrelevant information and selectively attempt to gather further information.<sup>82</sup> When faced with a problem, beginners believe they already know what the problem is, defining it on the basis of its surface structure (its immediate, concrete, unique properties). Experts, on the other hand, are more attuned to the deep structure of the problem (its systematic properties) and seek to reformulate it to reach a solution based on previous experience.<sup>83</sup>

Obviously experts' schemas are developed from both their store of domain knowledge and their past experience. In fact, studies have shown that in routine situations experts rely less on domain knowledge in solving problems than on their past experiences handling similar situations.<sup>84</sup> This same research has suggested, however, that domain knowledge is crucial in the *learning* of scripts and schemas. Several studies, for example, in the area of medical education demonstrate that students in their early years of development use their knowledge of basic science in interpreting clinical information. "[B]iomedical knowledge provides a reliable tool for forming a coherent mental representation of a clinical case." However, this application of biomedical knowledge does not seem to endure. "The transition to the next stage seems to be initiated by *the effect of practical experience*."<sup>85</sup> In other words, domain knowledge provides an organizing framework for development of expert schemas. "[W]ell-organized, coherent information is easier to remember than disjointed

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<sup>81</sup> See Patel & Groen, *General & Specific Nature*, *supra* note 10, at 106; Weisberg, *supra* note 52, at 152; Cropley, *supra* note 52, at 258.

<sup>82</sup> Patel et al., *Reasoning and Instruction*, *supra* note 10, at 339 (study of medical students showing that, if a comparison is made between beginning students and intermediate students who have already been exposed to subject matter for some time, the intermediates utilize more information than either novices or experts. For novices, this can be explained by a lack of knowledge. For experts, however, it seems to be attributable to their ability to filter out irrelevant information. This use of irrelevant information by intermediates appears to be a sign that knowledge is becoming reorganized.).

<sup>83</sup> Cropley, *supra* note 52, at 258-59. See also Kaufman & Patel, *supra* note 10, at 467. Clinical law teachers have first-hand experience with this phenomenon on a regular basis. A student will interview a client and, without examining the deep structure of the problem (either the precise factual or procedural posture of the case), will identify a solution based solely on the client's story or selected legal documents.

<sup>84</sup> Patel & Kaufman, *supra* note 10, at 121 (observing that in the medical field "basic science does not contribute directly to reasoning in clinical problem solving for experienced clinicians"). See also Patel & Groen, *General & Specific Nature*, *supra* note 10, at 114 (study in medical field showing that recall of relevant information is nonmonotonic, as a function of diagnostic accuracy, with intermediates recalling more than experts).

<sup>85</sup> Henry P. A. Boshuizen & Henk G. Schmidt, *supra* note 10, at 167 (emphasis in the original). One study of medical education, for instance, found that second-year students made extensive use of basic science knowledge. By their fourth year, students gave explanations which resembled expert physicians. Patel & Kaufman, *supra* note 10, at 121.

collections of facts.”<sup>86</sup> Domain knowledge provides the mechanization for understanding and identifying problem structure.<sup>87</sup>

## 2. *Enhancement of Forward Reasoning*

Closely related to the role of domain knowledge in the development of organization of schemas, another effect of well-organized domain knowledge in the problem-solving process is the enhancement of forward reasoning. Cognitive psychologists distinguish between *forward reasoning* in which the problem solver works from given information to a hypothesis, and *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.”<sup>88</sup> In the medical field, for instance, “*Forward reasoning* is characterized by drawing inferences from available data (e.g., a patient’s symptoms) and sequentially moving toward the solution of a problem without having to explicitly test and evaluate hypotheses (e.g., medical diagnoses).”<sup>89</sup> If a doctor has seen the same kind of medical condition many times before, she will likely use forward reasoning, recognizing important cues in the patient’s symptoms that will lead directly to a diagnosis. A novice physician, however, will likely use backward reasoning, thinking through the problem more explicitly, developing alternative hypotheses about the possible diagnoses, and testing out these theories with the information discovered from the patient.<sup>90</sup> Forward reasoning provides an efficient, natural way of approaching problems. While it entails inductive thinking, backward reasoning is basically a deductive process.<sup>91</sup>

Research has demonstrated that forward reasoning is more typically associated with accurate problem-solving than backward reasoning.<sup>92</sup> One study in the medical field, for example, compared the performance of physicians from three specialties – cardiology, surgery, and psychiatry – in diagnosing a cardiology case and then examined the performance of endocrinologists and cardiologists in diagnosing two other cases, one in the area of endocrinology and the other in the area of cardiology. As would be expected, the specialists in the differ-

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<sup>86</sup> *Id.* at 126.

<sup>87</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 335.

<sup>88</sup> Weinstein, *supra* note 15, at 27. See also Patel et al., *Medical Expertise*, *supra* note 10, at 394.

<sup>89</sup> Patel et al., *supra* note 4, at 82.

<sup>90</sup> *Id.*

<sup>91</sup> Patel et al., *Reasoning and Instruction*, *supra* note 10, at 338.

<sup>92</sup> See, e.g., Patel & Groen, *General & Specific Nature*, *supra* note 10.

ent fields provided more accurate diagnoses than the nonspecialists.<sup>93</sup> Surprisingly, however, the data showed no difference in recall of relevant propositions between the specialists and nonspecialists. The accuracy of diagnosis then did not depend on the ability of the subjects to distinguish between relevant and irrelevant information.<sup>94</sup> The presence or absence of forward reasoning did, however, appear to be strongly related to diagnostic accuracy.<sup>95</sup> In fact, all the subjects who made completely accurate diagnoses used pure forward reasoning, whereas none of the subjects who made inaccurate diagnoses used this process.<sup>96</sup>

The reason for this correlation between forward reasoning and accurate problem solving appears to be the well-organized schematas learned by experts. When confronted with a problem, experts use these schemas – organized with their extensive knowledge of the domain – to structure the basic information and proceed forward to a hypothesis. The novice solver, without an adequate foundation in domain knowledge, needs to first formulate different hypotheses and then has to test them.<sup>97</sup> This process — backward reasoning — is slower and, because it makes heavy demands on working memory, it is less accurate than forward reasoning.<sup>98</sup>

### 3. *Use of Contextual Information*

Increased domain knowledge also facilitates problem-solving by providing the solver with contextual information about the situation. A problem can place a heavy burden on a person's cognitive processes to organize, retain, and integrate all the given information. Domain knowledge assists experts in categorizing and retaining this information and, by placing it in context, expedites the problem-solving process.<sup>99</sup>

Several empirical studies support this conclusion. One study, comparing the handling of Social Security disability cases by experienced lawyers and law students, found that the students had difficulty

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<sup>93</sup> *Id.* at 101.

<sup>94</sup> *Id.*

<sup>95</sup> *Id.* at 102.

<sup>96</sup> *Id.*

<sup>97</sup> See Weinstein, *supra* note 15, at 26 (study comparing the handling of a Social Security case by experienced lawyers and law students found that one inexperienced solver “sorted the facts into legal categories . . . [but] [t]here was no evidence that she related the legal ideas to each other to develop a theory of eligibility”).

<sup>98</sup> Patel & Groen, *General & Specific Nature*, *supra* note 10, at 94. Obviously, however, in the absence of adequate domain knowledge, forward reasoning is highly error-prone. *Id.*

<sup>99</sup> Devine & Kozlowski, *supra* note 4, at 296.

formulating even the basic issues in a case.<sup>100</sup> The study concluded,

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," but is least able to identify context defining goals. The inexperienced solver can survey the range of possible goals, but will most likely only identify substantive legal goals which have little or no procedural information and provide little guidance about how to reach the substantive aspect of the goal.<sup>101</sup>

Similarly, the study found that the inexperienced solvers displayed a lack of attention to the actual language of the law and imprecision in their characterization of the facts of the case.<sup>102</sup> These problems, the study concluded, did not result simply from the fact that the experienced lawyers knew more law – both the experienced lawyers and law students had been provided with the same legal materials and fact problem – but more importantly from the law students' lack of contextual knowledge.<sup>103</sup> Without a larger context for interpreting the regulatory language and facts, the inexperienced subjects faced substantial obstacles in their problem solving.

Similarly, another study in a different domain – the area of medicine – demonstrates that sensitivity to contextual information is critical for adequate diagnosis of patients.<sup>104</sup> In that study, researchers compared the accuracy of diagnosis by experienced doctors and final-year medical students. After being shown certain information on patient charts, the subjects were asked for the most likely diagnosis and the information on which they relied to come to that opinion. The study found that the superior diagnostic performance of the experienced physicians was accomplished by better recall of relevant contextual information (e.g., the kind of diseases the patients have suffered from in the past, the drugs they use or have been using, and the nature of their work environment).<sup>105</sup> That contextual information is based both on the practitioners' past experience with other patients and their domain knowledge of the effects of other diseases, drugs, and the environment on the body.

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<sup>100</sup> Weinstein, *supra* note 15, at 37-38.

<sup>101</sup> *Id.* at 37.

<sup>102</sup> *Id.* at 38.

<sup>103</sup> *Id.* at 39. This problem is exacerbated by the increased usage of computer-based research. In my experience, law students in clinical programs often will retrieve the applicable section of the statute or regulation on LEXIS or WESTLAW, but will fail to recover the provisions that set the context for that section (e.g., a relevant definitions provision).

<sup>104</sup> P.P.M. Hobus, H. G. Schmidt, H. P.A. Boshuizen & V. L. Patel, *Contextual Factors in the Activation of First Diagnostic Hypothesis: Expert-Novice Differences*, 21 MED. ED. 471 (1987).

<sup>105</sup> *Id.* at 465-76.



#### 4. *Facilitating Communication*

Not only does domain knowledge furnish contextual information for problem solving, but it also provides a language for communicating with colleagues about problems. In many professions, including legal practice, team decision-making is a regular occurrence.<sup>106</sup> Such collaboration requires communication to formulate problems, organize tasks, coordinate responsibilities, and orchestrate actions. Domain knowledge provides the common vocabulary for facilitating explanation and coherent communication.<sup>107</sup> While an expert, working on a problem solely by herself, can rely on learned schemas for handling the situation and does not have to make explicit the explanations for her reasoning process, once she needs to coordinate her work with colleagues, she needs to be able to explain her logic and actions.<sup>108</sup> As one study described the role of domain knowledge in the field of medicine, "An expert physician and team leader needs to be able to articulate what would ordinarily be tacit knowledge as well as coaxing other team members, when necessary, to make their assumptions as explicit as possible so that they can be considered in the context of treatment and management options."<sup>109</sup>

#### 5. *Handling Difficult Cases*

As described above, when experts engage in everyday problem solving, they do not simply apply the stockpile of domain knowledge they have learned to the problem but rely on learned schemas or scripts, specific problem-solving strategies.<sup>110</sup> Cognitive psychologists have found, however, that when the problem is not routine, but is difficult and uncertain, experts resort to their domain knowledge to tackle the issues.<sup>111</sup> Faced with such a problem, forward reasoning is not helpful because the situation is not similar to previous cases, and the expert must engage in backwards reasoning, developing and testing hypotheses.<sup>112</sup> Just as domain knowledge helps practitioners com-

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<sup>106</sup> See Carrie Menkel Meadow, *Aha? Is Creativity Possible in Legal Problem Solving & Teachable in Legal Education*, 6 HARV. NEGOT. L. REV. 97, 141 (2001).

<sup>107</sup> Patel & Kaufman, *supra* note 10, at 126.

<sup>108</sup> Patel & Groen, *General & Specific Nature*, *supra* note 10, at 107 (study showing that expert physicians "did not use detailed scientific biomedical information during diagnostic reasoning (forward reasoning). Physicians do not use this information in their everyday practice, but they do appear to have it when probed for a biomedical explanation of a problem.").

<sup>109</sup> Patel et al., *supra* note 4, at 88-89 (observing that "[a]n effective clinical teacher [of medical students] needs to be able to articulate knowledge that would normally be tacit for a practitioner not engaged in instruction"). See *infra* notes 284-88 and accompanying text.

<sup>110</sup> See *supra* notes 78-83 and accompanying text.

<sup>111</sup> Patel & Kaufman, *supra* note 10, at 121.

<sup>112</sup> Patel et al., *Conceptual Changes*, *supra* note 10, at 387.

municate with other colleagues in the collaborative process by giving them a common vocabulary, it helps an expert who is facing a difficult problem work it out by providing reference points for the decision-making process.

## 6. *Developing Creative Solutions*

Cognitive psychologists have also demonstrated that domain knowledge plays a significant role in the creative process.<sup>113</sup> As described above, they have distinguished between the creative products of geniuses and everyday creativity, the ability of most normal brains to develop novel and appropriate solutions to problems.<sup>114</sup> Researchers have found similarities in the processes used in both types of creativity, but, for purposes of this article, I will focus primarily on the normative creativity used by professionals in the problem-solving process.

In a number of books and articles, the cognitive psychologist, Mihaly Csikszentmihalyi has set forth his theory of "flow," the optimal psychological experience that enhances, among other things, creativity.<sup>115</sup> Csikszentmihalyi and his colleagues interviewed a large number of individuals who were considered "creative" in a variety of fields and found a common thread:

Artists, athletes, composers, dancers, scientists, and peoples from all walks of life, when they describe how it feels when they are doing something that is worth doing for its own sake, use terms that are interchangeable in their minutest details. This unanimity suggests that order in consciousness produces a very specific experiential state, so desirable that one wishes to replicate it as often as possible. To this state, we have given the name of "flow," using a term that many respondents used in their interviews to explain what the optimal experience felt like.<sup>116</sup>

Flow – the enjoyment that comes from surpassing ourselves, from mastering new obstacles, from making new discovery – motivates us to creative activity.<sup>117</sup>

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<sup>113</sup> For a definition of creativity see *supra* note 53 and accompanying text.

<sup>114</sup> THOMAS B. WARD, STEVEN M. SMITH, & JYOTSNA VAID, *CREATIVE THOUGHT: AN INVESTIGATION OF CONCEPTUAL STRUCTURES AND PROCESSES* 4 (1997).

<sup>115</sup> See, e.g., CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50; CSIKSZENTMIHALYI, *FLOW*, *supra* note 50; Mihaly Csikszentmihalyi, *Society, Culture, & Person: A Systems View of Creativity*, in *THE NATURE OF CREATIVITY: CONTEMPORARY PSYCHOLOGICAL PERSPECTIVES* 325 (Robert J. Steinberg, ed. 1988).

<sup>116</sup> Mihaly Csikszentmihalyi, *The Flow Experience & Its Significance for Human Psychology*, in *OPTIMAL EXPERIENCE* "PSYCHOLOGICAL STUDIES OF FLOW IN CONSCIOUSNESS" 15, 29 (Mihaly Csikszentmihalyi & Isabella Selega Csikszentmihalyi, eds. 1988).

<sup>117</sup> MIHALY CSIKSZENTMIHALYI, *THE EVOLVING SELF* 175-76 (1993); CSIKSZENTMIHALYI, *FLOW*, *supra* note 50, at 74 ("In our studies, we found that every flow

To experience flow, Csikszentmihalyi found, a person must become totally immersed in the activity. Flow transports us to a "new reality," to a more complex self.<sup>118</sup> To accomplish this transformation, a person must pay close attention to her actions so she can monitor feedback and concentrate on achieving her goals.<sup>119</sup> Moreover, she needs to enjoy herself by staying close to the "boundary between boredom and anxiety."<sup>120</sup> When there are too many demands, options, and challenges to handle, a person feels anxious and becomes paralyzed; when there are too few, she becomes bored.<sup>121</sup> That point between boredom and anxiety allows for "convergent" thinking (conventional intelligence oriented to finding the one "correct" answer) but also "divergent" thinking (the ability to produce a number of possible answers based on the available information).<sup>122</sup> The tension between these types of thinking evolves into a creative idea: holding on to what is accepted but being open to new viewpoints and ideas.<sup>123</sup>

Obviously, a strong grasp of domain knowledge is necessary for conditions of flow. It is impossible for a person to pay close attention to actions, monitor feedback, or concentrate on achieving goals if she does not have a basic level of knowledge about the domain.<sup>124</sup> Without this knowledge, she will be unable to identify her ultimate goal, grasp the important details on which she must focus, or recognize the relevant information to use. Indeed, if a person is called upon to solve a problem for which she does not have adequate domain knowledge,

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activity, whether it involved competition, chance, or any other dimension of experience, had this in common: It provided a sense of discovery, a creative feeling of transporting the person into a new reality.").

<sup>118</sup> CSIKSZENTMIHALYI, *FLOW*, *supra* note 50, at 74.

<sup>119</sup> *Id.* at 210-12.

<sup>120</sup> *Id.* at 54.

<sup>121</sup> *Id.* at 228.

<sup>122</sup> CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50, at 60. *See generally* Cropley, *supra* note 52, at 254-55 (1999).

<sup>123</sup> CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50, at 103. Csikszentmihalyi calls the creative thought inspired by this tension, "the AHA!" experience, the ability to discover a new insight which a person knows is appropriate to the situation. Csikszentmihalyi also reports that his respondents reported one other major factor underlying their creative products: luck. *Id.* at 46. Unfortunately, that insight is not very helpful to this article.

<sup>124</sup> *Id.* at 90 ("You cannot transform a domain unless you first thoroughly understand how it works."). *See id.* at 7 (observing that "Edison's or Einstein's discoveries would be inconceivable without the prior knowledge, without the intellectual and social network that stimulated their thinking"). A few theorists have taken the view, based in part on self-reporting of the persons or myths about them, that creative insights spring from the minds of geniuses almost spontaneously. *See* GHISELIN, *supra* note 51. Most psychologists, however, reject this view, acknowledging geniuses' extraordinary accomplishments in their field but finding that the cognitive processes they used were ordinary: developing their works based on the "influences" of their domain. *See, e.g.,* Weisberg, *supra* note 52, at 160-73 (noting that "[t]rue originality evolves as the individual goes beyond what others had done before").

she will likely become overcome by anxiety, and creative flow will be inhibited. Moreover, unless a person has an adequate base of domain knowledge, she cannot engage in the dual process of convergent and divergent thinking. She may be able to brainstorm numerous novel solutions to a problem but, without the ability to assess their efficacy in handling the particular problem, she cannot determine whether they are appropriate (convergent knowledge).<sup>125</sup>

#### *D. Domain Knowledge As A Hindrance to Effective Problem Solving*

“Experto credito” (Virgil, 19 B.C.)

“No lesson seems to be so deeply inculcated by the experience of life as that you never should trust experts” (Lord Salisbury, 1877)<sup>126</sup>

These quotations are actually confirmed by two contrasting empirical findings in the cognitive psychology literature on the abilities of experts. On the one hand, studies comparing problem solving (in areas such as medical diagnosis, physics, geometry, and computer programming) by experts and novices demonstrate that experts are substantially more accurate than novices.<sup>127</sup> On the other hand, research on judgment and decision making (in areas such as psychiatric judgments, selecting graduate students, detecting accounting fraud, predicting such things as the price of securities, bank failures, or the weather), experts do not always perform better than novices.<sup>128</sup> The difference in the findings of these two sets of studies depends in large part on the way experts and novices process domain knowledge.

Precisely because experts have organized their domain knowledge through scripts and schematas, an expert can become vulnerable to “fixation effects,” inflexibility in approaching problems.<sup>129</sup> Although schemas can make the problem-solving process more efficient, by proceduralizing (even routinizing) this process, they can limit the knowledge selected for use and the number of variables considered.<sup>130</sup> In many everyday situations, a well-organized knowledge base is advantageous. But experts can be at a disadvantage when they are faced

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<sup>125</sup> See CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50, at 60. In my experience, students in a law school clinic often find it easy to brainstorm novel legal theories for a client’s case but, without an adequate knowledge of the legal doctrine involved, are unable to assess their efficacy in the particular case.

<sup>126</sup> Shanteau, *supra* note 70, at 252.

<sup>127</sup> Devine & Kozlowski, *supra* note 4, at 295.

<sup>128</sup> *Id.*

<sup>129</sup> Frensch & Sternberg, *supra* note 57, at 176; Weinstein & Morton, *supra* note 36, at 869 (observing that “repeated use of specific thought processes and knowledge bases creates deep ruts”); Wiley, *supra* note 9, at 727.

<sup>130</sup> Marchant et al., *supra* note 8, at 282; Hershey et al., *supra* note 9, at 98.

with new information that is incompatible with their existing knowledge.<sup>131</sup> One study, for example, has shown that experienced accountants were less able to adapt to an exception to established tax law than introductory tax students.<sup>132</sup>

This issue of inflexibility can become especially significant when an expert faces an inherently complex problem,<sup>133</sup> one in which the goals are unclear and many contingencies need to be taken into account. Studies demonstrate that experts solve problems more effectively than novices when they are faced with well-structured problems that can be easily addressed through their organized knowledge base.<sup>134</sup> But when the problem is ill-structured, experts attempt to add structure by making inferences and using their schemas to convert the problem into a well-structured one that can be more easily solved.<sup>135</sup> "[T]he necessary increase in cognitive activity required to convert such a problem into a well-structured problem increases the likelihood of error."<sup>136</sup> Indeed, an expert's attempt to restructure the problem can lead to disregarding crucial variables.

Finally, domain knowledge can be a hindrance to recalling exact information about a problem. Studies have shown that "intermediates" (persons between novices and experts, such as third-year medical interns) can remember exact information about a problem better than experts.<sup>137</sup> One study, for example, found that although doctors are more accurate at diagnosing patients than upper-level medical students, they are worse at remembering the exact information that was the basis of those diagnoses.<sup>138</sup> This difference arises from the fact that experts process information through their schematas while intermediates do not differentiate between relevant and irrelevant information.<sup>139</sup>

### III. ROLE OF DOMAIN KNOWLEDGE IN LEARNING CREATIVE PROBLEM SOLVING

The description in the previous section of the role that domain knowledge plays in creative problem solving does not address the is-

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<sup>131</sup> Frensch & Sternberg, *supra* note 57, at 169.

<sup>132</sup> Marchant et al., *supra* note 8, at 272. See Marchant & Robinson, *supra* note 7, at 15 (observing, "even in the legal environment, proceduralization may occur that blinds the expert to the different or unusual circumstances that may occur").

<sup>133</sup> See *supra* notes 74-83 and accompanying text.

<sup>134</sup> Wiley, *supra* note 9, at 717.

<sup>135</sup> Devine & Kozlowski, *supra* note 4, at 295.

<sup>136</sup> *Id.*

<sup>137</sup> Wiley, *supra* note 9, at 716-17.

<sup>138</sup> *Id.* at 716.

<sup>139</sup> See *id.* at 716-17.

sue of the effectiveness of particular pedagogical methods in teaching problem solving. The studies reviewed demonstrate that domain-specific knowledge plays a crucial role in organizing practical experience, that it facilitates forward reasoning and thereby expedites the problem-solving process, that it assists in collaborative communication in decision-making, helps in understanding difficult cases, and provides a necessary basis for creative solutions. But they do not show how a novice – a law student, medical student, or any other professional – becomes an expert problem-solver in their field. A general weakness in much expertise research is a focus on performance rather than the learning process.

### *A. Development from Novice to Intermediate to Expert*

Research, especially in the field of medical education, demonstrates that novices, intermediates, and experts handle the information-gathering process in different ways. Novices engage in limited data-gathering searches because they do not have a knowledge base to support their searches.<sup>140</sup> In a study in the legal field, for example, the researcher found that inexperienced problem-solvers attended to information in the order presented without an attempt to organize it.<sup>141</sup> Intermediates, however, engage in a wide scope of information-gathering without screening out irrelevant information.<sup>142</sup> In other words, they process too much garbage.<sup>143</sup> Even if they have adequate prior knowledge, they become distracted by irrelevant cues, identify unnecessary goals, and rely on extraneous portions of their knowledge base.<sup>144</sup> Medical residents, for example, make far more differential diagnoses, formulate more clinical findings, and generate more requests for unnecessary medical tests than students or senior doctors.<sup>145</sup> Moreover, in patient interviews, residents make no attempt to elaborate on the patient's complaint but present her with a series of probes, asking for "yes" or "no" responses.<sup>146</sup> Experts, on the other hand, use their schemas to screen out irrelevant information and develop fast and accurate solutions.<sup>147</sup> Unlike a medical resident, for instance, a senior doctor in a patient interview uses her schematas to reach a hypothesis of the patient's complaint and pursues an informa-

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<sup>140</sup> See, e.g., Patel & Groen, *Developmental Accounts*, *supra* note 10, at 530.

<sup>141</sup> Weinstein, *supra* note 15, at 15.

<sup>142</sup> See, e.g., Patel & Groen, *General & Specific Nature*, *supra* note 10, at 121; Patel & Groen, *Developmental Accounts*, *supra* note 10, at 530-32.

<sup>143</sup> Patel & Groen, *Developmental Accounts*, *supra* note 10, at 532.

<sup>144</sup> Patel & Groen, *General & Specific Nature*, *supra* note 10, at 121.

<sup>145</sup> Patel & Groen, *Developmental Accounts*, *supra* note 10, at 530.

<sup>146</sup> *Id.* at 532.

<sup>147</sup> See, e.g., Kaufman & Patel, *supra* note 10, at 532.

tion-gathering agenda to confirm the diagnosis.

### B. Guiding Novices to Expertise

A crucial issue then becomes how to guide professional students to higher levels of expertise. A number of significant studies on this issue in the field of medical education have been conducted by Vimla Patel and her colleagues at McGill University's Centre for Medical Education.<sup>148</sup> They have compared the effectiveness of two different medical school curricula in teaching problem solving at two Canadian universities: McGill and McMaster.<sup>149</sup> At the time of the different studies, McGill used a Conventional Curriculum ("CC") in which the basic sciences were taught first in separate discipline-based courses, and clinical exposure was given after about one-and-a-half years of medical training.<sup>150</sup> Illustrative clinical problems were used during the first year-and-a-half, but the primary mode of teaching was didactic presentation of basic science knowledge.<sup>151</sup> Only after students were steeped in basic science doctrine were they introduced to the problems raised by patient care.

McMaster uses a Problem-Based Learning curriculum ("PBL") under which basic science is taught in the context of clinical problems.<sup>152</sup> Students are introduced to patients within the first unit of the curriculum and "are presented with a series of health care problems requiring their solution, the understanding of underlying physical, biological and behavioural principles, the appropriate collection of data and the critical appraisal of evidence."<sup>153</sup> Students ex-

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<sup>148</sup> See *supra* note 10.

<sup>149</sup> See Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 381. For a good survey of the general research comparing CC and PBL curricula, see Vimla Patel et al., *Impact of Undergraduate Medical Training on Housestaff Problem Solving Performance: Implications for Health Education in Problem-Based Curricula*, 65 J. DENTAL EDUC. 1199, 1199-2000 (2001).

<sup>150</sup> Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 381. Subsequent to these studies, McGill modified its curriculum to include some problem-solving units in the first two years. See *McGill Undergraduate Medical Education: Curriculum Introduction*, at <http://www.medicine.mcgill.ca/ugme/curricstructure.htm>.

<sup>151</sup> See Patel et al., *Reasoning and Instruction*, *supra* note 10, at 336.

<sup>152</sup> Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 380. McMaster is a leader in PBL teaching. As the school touts on its website, "Since the introduction of a problem-based learning (PBL) curriculum at the McMaster University School of Medicine in 1969, many medical schools in different regions of the world have adopted this approach . . ." Robert M.K.W. Lee & Chiu-Yin Kwan, *Overview: PBL, What is It?*, at [http://www.fhs.mcmaster.ca/mdprog/pbl/overview\\_pbl.htm](http://www.fhs.mcmaster.ca/mdprog/pbl/overview_pbl.htm).

<sup>153</sup> McMaster University, *Overview: Education Methods*, at [http://www.fhs.mcmaster.ca/mdprog/overview/overview\\_edumethods.htm](http://www.fhs.mcmaster.ca/mdprog/overview/overview_edumethods.htm). For a current listing of the different units in the curriculum, see McMaster University, *Overview: Description of the Units*, at [http://www.fhs.mcmaster.ca/mdprog/overview/overview\\_edumethods.htm](http://www.fhs.mcmaster.ca/mdprog/overview/overview_edumethods.htm).

plore basic science and clinical subjects simultaneously without clear distinctions between the two curricular components.<sup>154</sup> The curriculum attempts to integrate these two components by teaching different hypothetico-deductive problem-solving methods to be used in treating a patient.<sup>155</sup> Additionally, instead of using the traditional lecture method, McMaster emphasizes small-group learning and self-directed learning methods.<sup>156</sup>

In their studies, Patel and her colleagues have compared medical school students and graduates from the two schools to determine whether the different curricula affected reasoning characteristics and knowledge used by students and physicians. In one set of studies, they compared how medical students at McGill and McMaster at three different levels of training (first, second, and fourth years) utilized basic science knowledge. They gave some students at each of these schools a clinical case without the presentation of any additional information and asked them for explanations of the case. They then gave other students basic science material either immediately prior to or immediately after the presentation of a clinical case and asked them to explain the case in terms of that material. They then compared the types of explanations given by the students taking into account their level of study and their school's particular curriculum.<sup>157</sup>

These studies demonstrated that students from the two schools integrated basic scientific and clinical information about the patient differently.<sup>158</sup> For the purposes of these studies, basic scientific information was considered to be explicit references by the subjects to the biological sciences (e.g., physiology, pathophysiology, anatomy, and biochemistry); clinical information was considered to be references to

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<sup>154</sup> Patel et al., *supra* note 149, at 1199.

<sup>155</sup> See Patel et al., *Conceptual Change*, *supra* note 10, at 352.

<sup>156</sup> Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 380. On its current website, McMaster describes its use of these methods:

The central focus of the programme is the tutorial. The class is divided into small groups, each with a tutor. In the tutorial session students develop a series of learning objectives from each health-care problem and negotiate how they will approach their learning tasks. They then acquire the knowledge and skills to meet the objectives of the unit in which they are working. They also learn to work as a team, helping and learning from their peers. The study habits and sense of responsibility to self and others provides a basis for life long working and learning habits.

McMaster University, *Overview: Education Methods*, at [http://www.fhs.mcmaster.ca/md-prog/overview/overview\\_edumethods.htm](http://www.fhs.mcmaster.ca/md-prog/overview/overview_edumethods.htm).

<sup>157</sup> See, e.g., Patel & Kaufman, *supra* note 10, at 122; Patel et al., *Reasoning and Instruction*, *supra* note 10, at 335; Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 380.

<sup>158</sup> Patel and her colleagues define "integration" as the "linking of biomedical and clinical information into a coherent explanation, measured in terms of the number of biomedical concepts that are used to solve and explain a clinical problem." Patel et al., *Conceptual Change*, *supra* note 10, at 339.



the patient's symptoms, signs, diseases without any explicit reference to biological concepts.<sup>159</sup>

When basic scientific information about the problem was provided before the clinical problem, students from both schools gave explanations that showed a lack of integration of basic science knowledge into the clinical context. Their reasoning showed errors of scientific fact, use of irrelevant as well as relevant information, a tendency toward circular reasoning, and, overall, a lack of coherence in their knowledge structures.<sup>160</sup> But when the clinical problem was given on its own, without the presentation of any other information, PBL subjects – including beginning students – used rather detailed biomedical information in their explanations while CC subjects used more clinical than biomedical information.<sup>161</sup> And when the scientific information was given after the clinical problem, students from both schools integrated basic scientific concepts into the clinical context, but PBL students demonstrated better integration than CC students.<sup>162</sup> Reflecting their contrasting curricula, CC students did not integrate basic science and clinical information in their explanations while PBL students did engage in such integration.<sup>163</sup>

Based on these data, Patel and her colleagues concluded that the two schools inculcated their students in quite different patterns of reasoning. For CC students (except beginning ones), basic science information was not used spontaneously in giving explanations of patients' problems.<sup>164</sup> Specifically, despite the scientific orientation of their initial curriculum, when confronted with the clinical problem alone, CC students focused more on clinical information than biomedical information in their explanations, and when given the scientific materials after the problem, they were less prone to integrate their scientific knowledge into their explanations. Like expert physicians, they showed a preponderance of forward reasoning, generating fewer elaborations than PBL subjects.<sup>165</sup> And like experts, they only used basic scientific concepts when they experienced difficulty with the patient problem or were asked to give globally-coherent explanations of the patient problem.<sup>166</sup>

PBL students, however, were unable to separate basic science and

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<sup>159</sup> See *id.* at 338.

<sup>160</sup> *Id.* at 340; Patel et al., *Reasoning and Instruction*, *supra* note 10, at 374.

<sup>161</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 340; Patel et al., *Reasoning and Instruction*, *supra* note 10, at 354-63.

<sup>162</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 340-41.

<sup>163</sup> *Id.* at 341.

<sup>164</sup> *Id.*

<sup>165</sup> *Id.* at 342.

<sup>166</sup> *Id.* at 341.

clinical knowledge. Explanations provided by PBL students, regardless of whether they used basic science or not, contained the same detailed descriptions of biomedical information to account for analogous problems that actually involved different pathophysiological mechanisms. Also, examination of PBL students' semantic representations of their clinical case explanations showed that, besides basic science and clinical knowledge relevant to the problems, they contained a large amount of additional knowledge that was unrelated to the problems. In this regard, PBL seems to promote a type of learning in which basic biomedical knowledge becomes so tightly tied to specific clinical problems that it becomes difficult to separate them.<sup>167</sup>

Because of this integration, PBL students generated a greater number of elaborations of a problem than CC students, including a greater amount of irrelevant information when they interpreted the features of the problem.<sup>168</sup> This tendency, the researchers assert, reflects the hypothetico-deductive method in the PBL curriculum, under which students are introduced to different problem-solving methods and are asked to brainstorm alternative diagnosis hypotheses and elaborate on each aspect of a diagnosis.<sup>169</sup> Indeed, the PBL subjects were prone to use backwards reasoning in their explanations, working from hypotheses to data.<sup>170</sup>

Expanding on these studies, Patel and her associates then examined whether or not these differences in patterns of reasoning survived beyond medical school. To address this issue, they investigated the utilization of basic science concepts by medical residents from the two schools to determine whether the differences found in their research with medical students would be sustained after some years of clinical practice.<sup>171</sup> In this study they gave the subjects a booklet containing the actual patient charts for two patients containing three segments: clinical history, physical examination, and laboratory data. After the presentation of each segment, the subjects were requested to write their thoughts. Then the subjects were asked to summarize the complete patient problem, give a differential diagnosis, suggest a

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<sup>167</sup> *Id.*

<sup>168</sup> *Id.*; Patel et al., *Reasoning and Instruction*, *supra* note 10, at 374.

<sup>169</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 341; Patel et al., *supra* note 4, at 93; Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 387 (observing that the PBL students "had learned a systematic process of thinking that was explicitly taught. The predominance of backward reasoning, the systematic use of clinical information, and the tendency to formulate extensive elaborations are all consistent with the notion that the students were generating diagnostic explanations through the use of hypothetico-deductive reasoning.").

<sup>170</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 342.

<sup>171</sup> *See id.* at 343.

therapeutic and patient management plan, and explain the underlying pathophysiology of the case.<sup>172</sup> The researchers then analyzed the data focusing on the reasoning process used by the subjects from different schools.<sup>173</sup>

Remarkably, the results of this study mirrored the findings of the medical student research. Residents from a CC program used more clinical concepts in their explanations than those from a PBL program. CC residents also displayed a greater use of forward reasoning than PBL residents, and PBL residents showed a greater tendency for backward reasoning and greater elaborations.<sup>174</sup> These findings show, therefore, that the different curricula can have long-term effects on the reasoning process of the school's students.

Based on these studies, Patel and her colleagues hypothesize that the PBL approach may actually hinder the acquisition of forward reasoning by students.<sup>175</sup> As described previously, forward-directed reasoning, based on a highly-organized knowledge base, enables an expert to solve problems efficiently and effectively.<sup>176</sup> Patel and her associates suggest that by teaching basic scientific concepts in the abstract, CC curricula may foster the development of efficient forward reasoning by giving their students a well-organized knowledge base with which to organize their clinical experiences.<sup>177</sup> PBL curricula, on the other hand, by integrating basic science and clinical information early in students' education and focusing on specific problem-solving methods, encourage "the development of a causal reasoning pattern, in detriment of a clinically driven knowledge base" and may result in limited acquisition of necessary expert scripts.<sup>178</sup> Such curricula encourage the development of the less efficient mode of backwards reasoning, an effect that can last several years, if not longer, into a physician's practice.

Moreover, the Patel studies indicate that because CC students learn basic sciences separately from the clinical context, they master it better than their CC counterparts. In the medical student studies, for example, the explanations of the PBL students were frequently of less quality than those of CC students.<sup>179</sup> They often contained errors of

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<sup>172</sup> *Id.* at 344-45.

<sup>173</sup> For the specific procedure used for analyzing the reasoning process used by the subjects, see *id.* at 345-46.

<sup>174</sup> *Id.* at 343-50.

<sup>175</sup> *Id.* at 351.

<sup>176</sup> See *supra* notes 88-97 and accompanying text.

<sup>177</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 351.

<sup>178</sup> *Id.* at 352-52; Patel et al., *supra* note 4, at 93 (commenting, "[F]orward reasoning seems to result from an adequate organization of knowledge, rather than from the deployment of explicitly learned reasoning or problem-solving strategies.").

<sup>179</sup> Patel et al., *Reasoning and Instruction*, *supra* note 10, at 374.

scientific fact and flawed patterns of explanation, such as circular reasoning.<sup>180</sup> With inadequate knowledge schemas, PBL students may be less able than CC students to transfer knowledge from one case to another.<sup>181</sup>

Patel and her associates observe that the PBL curriculum ignores the fact that basic science knowledge and clinical knowledge are two separate knowledge structures.

[C]linical knowledge is based on a complex taxonomy that relates disease symptoms to underlying pathology. In contrast, the biomedical sciences are based on general principles defining chains of causal mechanisms. Thus, learning to explain how a set of symptoms is consistent with a diagnosis may be different from learning how to explain what causes a disease.<sup>182</sup>

The CC curriculum ensures that basic science concepts are learned extremely well, which assists the students in developing through practice the taxonomy to relate disease symptoms to underlying pathology and in providing them with the necessary biomedical knowledge to communicate with colleagues and handle difficult cases.<sup>183</sup> The PBL curriculum, on the other hand, by conflating the two modes of reasoning, may make it extremely difficult for students to master the basic scientific knowledge needed to engage in expert clinical reasoning.<sup>184</sup>

The one possible negative consequence of the CC curriculum identified by Patel and her associates is the problem inherent in for-

<sup>180</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 342; Patel et al., *Effects of Conventional and Problem-Based Medical Curricula*, *supra* note 10, at 387.

<sup>181</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 351-52 (observing that, "the students and residents in a PBL school may exhibit restricted patterns of transfer wherein the understanding of biomedical concepts are context bound").

The Patel studies, especially those in regard to reasoning by medical students, are subject to criticism because many McMaster subjects lacked previous scientific experience before attending medical school. Patel et al., *Reasoning & Instruction*, *supra* note 10, at 374; see McMaster University, *Admissions: Q & A About Admissions*, at [http://www.fhs.mcmaster.ca/mdprog/admissions/admissions\\_qanda.htm](http://www.fhs.mcmaster.ca/mdprog/admissions/admissions_qanda.htm). This explanation for the discrepancy between PBL and CC students, however, is unlikely "because the pattern of errors in scientific explanation is uniform across PBL students, regardless of scientific background." Patel et al., *Reasoning and Instruction*, *supra* note 10, at 364. Moreover, all of the studies are subject to close scrutiny because of the limited number of subjects involved. See, e.g., *id.* at 345 (one experiment comparing eighteen students from each school and the other experiment focusing on thirty-six students). The findings of this research, however, are sufficiently robust that they at least support the tentative hypotheses of the researchers.

<sup>182</sup> Patel et al., *Reasoning and Instruction*, *supra* note 10, at 375.

<sup>183</sup> See Patel & Kaufman, *supra* note 10, at 126 (noting, "Perhaps the key role played by basic science may not be in facilitating clinical reasoning per se, but in facilitating explanation and coherent communication. . . . Basic science provides a powerful means of connecting disparate phenomena and of generating explanations that, if still inaccurate, are much more coherent."); Patel et al., *Reasoning and Instruction*, *supra* note 10, at 375.

<sup>184</sup> Patel et al., *Reasoning and Instruction*, *supra* note 10, at 375.

ward reasoning: scripted problem-solving.<sup>185</sup> When forward reasoning is used, errors in reasoning are difficult to eradicate because of the highly patterned problem-solving process. "Once an explanation is found for a case, CC-trained subjects seem to use the 'satisficing' principle that stops any further processing of the case."<sup>186</sup> PBL students, on the other hand, while prone to making errors of fact, are more likely to revise their explanations and learn from experience as they correct their errors.<sup>187</sup> To remedy this problem for CC students, the Patel team suggests that students be taught strategies to exploit the knowledge they have learned in more effective ways, for instance, methods for explicitly generating sets of related hypotheses.<sup>188</sup>

### C. Problem-Solving Methods and Cognitive Load

The Patel research demonstrates not only that PBL students trained in backward reasoning continue to use such an approach in practice, but also that they appear to master the basic sciences less effectively than CC students. PBL students have fewer opportunities to develop a solid conceptual foundation. This latter finding, investigators hypothesize, could be caused by problems of cognitive load.<sup>189</sup>

As discussed earlier, cognitive psychologists have found that humans have limited attention and processing capabilities.<sup>190</sup> Cognitive load theory posits that there are significant constraints on the cognitive resources that can be used during learning and problem solving.<sup>191</sup> Under this theory, if the instructional format requires students to engage in cognitive activities that are irrelevant to the pedagogical goals, knowledge acquisition can be impeded.<sup>192</sup> Accordingly, information should be presented in the teaching process in ways that do not impose a heavy extraneous cognitive load.<sup>193</sup>

The problems raised by cognitive load are reflected in several studies of the effectiveness of using specific problem-solving techniques in the learning process.<sup>194</sup> That research found that the use of

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<sup>185</sup> See *supra* notes 88-96 and accompanying text.

<sup>186</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 352.

<sup>187</sup> *Id.*

<sup>188</sup> Arocha & Patel, *supra* note 10, at 380.

<sup>189</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 342.

<sup>190</sup> See *supra* note 64 and accompanying text; CSIKSZENTMIHALYI, FLOW, *supra* note 50, at 28-29 (observing that, "It seems we can manage at most seven bits of information – such as differentiated sounds, or visual stimulus, or recognizable nuances of emotion or thought – at any one time").

<sup>191</sup> Chandler & Sweller, *supra* note 63, at 294.

<sup>192</sup> *Id.*

<sup>193</sup> *Id.* at 295.

<sup>194</sup> See, e.g., *id.* at 294; John Sweller, *Cognitive Load During Problem Solving: Effects on Learning*, 12 COGNITIVE SCI. 257 (1988); Chandler & Sweller, *supra* note 63, at 294.

some goal-directed search heuristics such as means-ends analysis, while facilitating problem solution, can create extraneous cognitive load and actually interfere with learning.<sup>195</sup> Subjects could solve problems, and in some cases repeatedly solve problems, but remain unaware of the essential structural features of the problem.<sup>196</sup> As two of these researchers assert, “[S]earching for suitable problem-solving operators is cognitively demanding and directs attention away from aspects of the problem important to learning.”<sup>197</sup>

Pointing to this research, Patel and her colleagues hypothesize that the PBL curriculum’s use of specific problem-solving methods may interfere with adequate learning of abstract biomedical concepts.<sup>198</sup> As discussed above, basic scientific knowledge and clinical knowledge are two different modes of cognition.<sup>199</sup> When students are asked to learn domain knowledge and problem-solving clinical techniques at the same time, their attentional resources are strained. They, therefore, may not be able to master the necessary basic scientific knowledge as effectively as students in the CC program.<sup>200</sup>

#### IV. DOMAIN KNOWLEDGE AND THE TRAINING OF LAWYERS

##### A. *The Role of Domain Knowledge in the Practice of Law*

The cognitive psychology studies on expertise and creativity have significant implications for the training of lawyers. Legal knowledge, like its medical counterpart, has two components: explicit knowledge of legal doctrine and tacit knowledge of the skills necessary to represent a client effectively.<sup>201</sup> As the psychological research demonstrates, these two types of knowledge are distinct but both are essential to the practice of the profession.<sup>202</sup> While lawyers may not explicitly consider legal doctrine in the context of practice, it forms the basis for their actions and reasoning process. Indeed, without

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<sup>195</sup> Sweller, *supra* note 194, at 260.

<sup>196</sup> Chandler & Sweller, *supra* note 63, at 294.

<sup>197</sup> *Id.*

<sup>198</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 342.

<sup>199</sup> See *supra* notes 11-12 and accompanying text.

<sup>200</sup> Patel et al., *Conceptual Change*, *supra* note 10, at 335.

<sup>201</sup> Since a substantial part of legal doctrine is developed in practice – through court cases, the legislative and administrative process, and professional custom – an argument can be made that legal doctrine is fundamentally different from the basic science doctrine taught in medical schools. Without entering into the philosophical debate whether “abstract” legal doctrine actually exists in the same way that the physical and chemical properties of basic science exist, suffice it to say, lawyers and decision-makers practice our profession as if there is such a doctrine. See Maureen Cain, *The Symbol Traders*, in *LAWYERS IN A POSTMODERN WORLD: TRANSLATION & TRANSGRESSION* 19 (Maureen Cain & Christine B. Harrington, eds. 1994).

<sup>202</sup> See *supra* notes 11-14 and accompanying text.

doctrinal knowledge, lawyers cannot adequately organize their experiences and become effective professionals in solving their clients' problems.<sup>203</sup>

Accordingly, some of the barbs thrown at legal education by recent commentators on legal problem solving do not give adequate attention to the crucial role played by legal doctrine in the practice of law. The argument, for example, that rule-based training ignores the relational process<sup>204</sup> disregards the fact that a lawyer's relationship with a client, an adversary, or a decision maker is organized around, at least initially, rule-based schemas. Similarly, the contention that doctrinal training stifles creative and flexible thinking<sup>205</sup> ignores the fact that creative products originate from a solid base of domain knowledge, not independent of it. A person must learn how to think inside the box before venturing to think outside of it. Although obviously improvements can be made in legal education to train students to become more sensitive to relational issues, the voices of the disadvantaged, and the opportunities for nonadversarial approaches to conflict resolution, the psychological research on expert problem-solving demonstrates that such improvements must take into account the significance of domain knowledge in the practice of law.

An examination of a few of the skills performed by attorneys clearly illustrate this point. In client interviewing, for example, a lawyer has a number of goals: (1) to form an attorney-client relationship; (2) to determine the client's goals; (3) to gather as much as the client knows about the facts surrounding her problem; and (4) to reduce the client's anxiety without being unrealistic.<sup>206</sup> Development of rapport with the client is certainly an important factor in achieving these goals. A lawyer will be most effective in the interview if she has ability to make the client feel comfortable, to encourage the client to communicate freely, and to remove inhibitions to communication, such as authority, cultural, psychological, or social barriers.<sup>207</sup> Realization of the ultimate goals of the interview, however, and, to a certain extent, the ability to establish rapport with the client, depends in large part on the knowledge base the lawyer brings to the interview. The development of a lawyer-client relationship requires a grasp of the contractual, fidu-

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<sup>203</sup> See *supra* note 84-87 and accompanying text.

<sup>204</sup> See *supra* notes 25-29 and accompanying text.

<sup>205</sup> See *supra* notes 35-36 and accompanying text.

<sup>206</sup> STEFAN H. KRIEGER & RICHARD K. NEUMANN, JR., *ESSENTIAL LAWYERING SKILLS: INTERVIEWING, COUNSELING, NEGOTIATION, AND PERSUASIVE FACT ANALYSIS* 80-81 (2d ed. 2003).

<sup>207</sup> *Id.* at 65-66. See generally Gay Gellhorn, *Law and Language: An Empirically-Based Model for the Opening Moments of Client Interviews*, 4 CLIN. L. REV. 321, 321-23 (1988) (describing stresses faced by a client coming to an initial interview).

ciary, and ethical obligations inherent in such a relationship.<sup>208</sup> Determination of the client's goals entails an understanding of the legal remedies available and procedural requirements in the particular situation.<sup>209</sup>

Similarly, fact-gathering involves inquiries based in large part on doctrinal knowledge. While some of the probing process at an interview is based simply on common sense notions of what should have happened next in the situation,<sup>210</sup> adequate questioning necessitates a good understanding of what is *supposed* to happen next in similar situations under established substantive doctrine or procedural rules.<sup>211</sup> Indeed, it is the much-maligned abstraction of legal rules that facilitates this process. Moreover, a legally sufficient story of the case cannot be fully developed from the client without an understanding of evidentiary rules concerning relevancy, authenticity, competency, and credibility.<sup>212</sup> Finally, factual inquiry to develop possible legal theories is difficult, if not impossible, without a fairly substantial knowledge base. In order to identify the facts necessary to support a legal claim or defense (in either a transactional or litigation context), a lawyer obviously needs to have a grasp of the relevant elements that must be established.<sup>213</sup>

Although the final goal of a client interview – reducing the client's anxiety without being unrealistic – appears to concern primarily issues of rapport, lawyers cannot achieve this goal without some knowledge base. An attorney can certainly attempt to allay a client's fears without an understanding of legal doctrine, but, without this knowledge, it will be impossible for her to communicate realistic expectations of what might happen in the case, let alone what steps she will take in the representation. Indeed, much of the literature urging law schools to train lawyers to be sensitive to client emotions and needs disregards the fact that the client, by coming to a lawyer in the

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<sup>208</sup> See CHARLES W. WOLFRAM, *MODERN LEGAL ETHICS* 145-48 (1986).

<sup>209</sup> Many commentators have contended that lawyers unwisely limit their examination of client relief solely to legal remedies. See, e.g., Menkel-Meadow, *supra* note 106, at 106. Although these arguments have validity, the converse is also obviously true: lawyers should not limit their considerations of relief to nonlegal remedies. Indeed, some of the most effective solutions to a client's problem might result from a creative blend of legal and nonlegal relief.

<sup>210</sup> See DAVID A. BINDER, PAUL BERGMAN, & SUSAN C. PRICE, *LAWYERS AS COUNSELORS* 132-33 (1991); KRIEGER & NEUMANN, *supra* note 206, at 147-48.

<sup>211</sup> In a mortgage foreclosure case, for example, without a rudimentary understanding of the doctrine concerning real estate contracts and financing, preconditions to foreclosure, and court procedural rules, a lawyer's interview of the client in the case will be very ineffective.

<sup>212</sup> See FED. R. EVID. 401-15; 602; 608-609; 901-902.

<sup>213</sup> See BINDER ET AL., *supra* note 210, at 146-53 (1991); KRIEGER & NEUMANN, *supra* note 206, at 175-78.



first place, wants expert assistance.<sup>214</sup>

Besides client interviewing, another example of the essential role played by legal doctrine in the lawyering process is legal negotiation. Much of the recent skills literature on this subject focuses on the need for interest-based "problem-solving" approaches to negotiation, rather than the rule-based "adversarial" methods.<sup>215</sup> Under the problem-solving model, each side is assumed to bring something of value to the deal that can create benefits to both parties, and the lawyers attempt to develop creative solutions – beyond traditional legal remedies – to integrate the resources of each party.<sup>216</sup> Although such an approach has obvious advantages,<sup>217</sup> the use of problem-solving negotiation methods does not render legal rules or doctrine irrelevant. Both transactional and litigation negotiation occur in "the shadow of the law."<sup>218</sup> While parties to a negotiation usually bring non-legal interests to the table, they frequently do not ignore the legal rights, claims, and defenses context within which the interests reside. Often-times, in fact, as hard as a lawyer might try to encourage her opponent to engage in problem-solving negotiation, her adversary will refuse. In such circumstances, the lawyer needs to be able to rely on the legal rules – either to respond to the opponent on his own adversarial turf or to convince him of the strength of her case to prod him into using a problem-solving approach.<sup>219</sup> In fact, most legal negotiations are not purely adversarial or problem-solving but are a mixture of both. Indeed, these rules themselves create value. And, even if both parties participate in the problem-solving process, the generation of options for integrating the parties' interests can be facilitated by considering variations to traditional legal remedies. Finally, in both transactional and litigation negotiations, procedural deadlines, prerequisites, and requirements often provide either constraints or opportunities for each party's leverage. Without an adequate understanding of those issues, a lawyer cannot be an effective negotiator.

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<sup>214</sup> See, e.g., Barton, *supra* note 26, at 279. Indeed, in the case described at the beginning of this article, the students' lack of a firm grasp of the relevant legal doctrine in the case increased the client's anxiety and interfered with effective client counseling.

<sup>215</sup> Carrie Menkel-Meadow, *Toward Another View of Legal Negotiation: The Structure of Problem Solving*, 31 UCLA L. REV. 754 (1984). See also Menkel-Meadow, *supra* note 106, at 106 (bemoaning the fact that "[d]ispute negotiation often looks for its solutions among the legal precedents or outcomes thought likely in the 'shadow of the courthouse' . . .").

<sup>216</sup> KRIEGER & NEUMANN, *supra* note 206, at 274.

<sup>217</sup> For an examination of the circumstances when the different negotiation approaches are most appropriate, see *id.* at 255-58.

<sup>218</sup> See Robert H. Mnookin & Lewis Kornhauser, *Bargaining in the Shadow of the Law: the Case of Divorce*, 88 YALE L.J. 950 (1979).

<sup>219</sup> KRIEGER & NEUMANN, *supra* note 206, at 330-31.

These descriptions of the role played by legal doctrine in interviewing and negotiation are just two of the many examples of the significance of domain knowledge in the context of the lawyering process. As the cognition research demonstrates, however, this knowledge is not explicitly applied by expert lawyers in practice.<sup>220</sup> When interviewing clients, for example, they do not usually articulate – either to themselves or their clients – the ethical rules for formation of an attorney-client relationship, the legal elements for the theories they are exploring, or the evidentiary rules for establishing a legally sufficient story. Likewise, in a negotiation, while expert attorneys might argue specific statutory or case authority, in most cases, they develop their arguments without explicitly accessing underlying doctrine. In practice, expert lawyers will use tacit knowledge – their schemas – for responding to particular information provided by clients, adversaries, or decision makers.<sup>221</sup>

Cognitive studies indicate that the successful utilization of tacit knowledge rests on invoking well-formed explicit knowledge structures.<sup>222</sup> Explicit knowledge does not provide professionals with pat “scripts” to use in particular situations; rather it gives them a structure to organize their actual experiences in practice to develop their tacit knowledge base. Legal rules in a specific subject matter area provide the framework for examining any legal problem in that area. Accordingly, the development of effective lawyering “schemas” – whether they are for interviewing, counseling, negotiation, fact investigation, or trial preparation – rests on a firm understanding of legal doctrine. Additionally, domain knowledge provides attorneys with tools for handling difficult cases. By providing a common reference point, it assists lawyers at all levels of expertise – from novice to intermediate to expert – in solving difficult problems. When faced with a case for which their schemas are inadequate, attorneys can use their legal doctrine base to develop legal research strategies, to refine their arguments, or to consider ways of expanding or narrowing the law.<sup>223</sup> Moreover, by providing a common language, legal doctrine helps facilitate communication between colleagues and their adversaries in their search for solutions to difficult problems.<sup>224</sup>

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<sup>220</sup> See *supra* notes 78-83 and accompanying texts.

<sup>221</sup> See *id.*

<sup>222</sup> See, e.g., Patel et al., *supra* note 4, at 77-79.

<sup>223</sup> See *supra* notes 110-12 and accompanying text.

<sup>224</sup> See *supra* 106-109 and accompanying text.

### B. *The Role of Domain Knowledge in Present Skills Training Methods*

The fact that legal doctrine plays a significant role in structuring a lawyer's practical experience refutes somewhat the argument that the traditional law school curriculum's focus on appellate cases, rules, statutes, and the procedures of the adversary method is based on "flawed premises."<sup>225</sup> But recognizing that substantive legal doctrine is essential to expert problem solving does not address the issue of the most effective methods for training students how to apply that doctrine in practice. Tentative answers to that question can be found by examining the research on expert performance, especially the Patel studies on medical education. Obviously, there are problems with applying this research to the legal setting: although similar in some respects, the medical and legal reasoning processes are not identical;<sup>226</sup> the curricula in law and medical schools have some substantive differences;<sup>227</sup> and the Patel studies themselves have some methodological weaknesses.<sup>228</sup> To begin to answer fully the question of the role of domain knowledge in legal skills training, empirical studies need to be conducted in the law school setting.<sup>229</sup> In the meantime, however, the Patel studies and others on expert learning are useful for making some tentative observations about some of the methods presently used for skills training in law schools.

#### 1. *Brainstorming and Other Problem-Solving Methods*

Much of the literature on teaching legal problem solving strongly recommends the use of brainstorming and other heuristic devices to encourage student creative problem solving.<sup>230</sup> As one text advises students,

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<sup>225</sup> Kerper, *supra* note 3, at 352-53. Professor Kerper acknowledges that the case method should be a "tool in the lawyer's toolbox," *id.* at 355, but downplays the significance of the role it plays in the lawyering process.

<sup>226</sup> See *supra* notes 11-14 and accompanying text.

<sup>227</sup> See Roger C. Cramton, *Professional Education in Medicine and Law: Structural Differences, Common Failings, Possible Opportunities*, 34 CLEV. ST. L. REV. 349, 352-53 (1986).

<sup>228</sup> See *supra* note 179, at 341-42.

<sup>229</sup> In fact, Vimla Patel and David Kaufman, one of her associates for her medical school studies, and I are now developing such a research project in the context of legal education.

<sup>230</sup> See, e.g., ROGER S. HAYDOCK, PETER B. KNAPP, ANN JUERGENSEN, DAVID HERR & JEFFREY STEMPEL, *LAWYERING: PRACTICE AND PLANNING* 25-27 (1996); Michael McDonnell, *Playing Beyond the Rules: A Realistic and Rhetoric-Based Approach to Researching the Law and Solving Legal Problems*, 67 UMKC L. REV. 285, 308-10 (1998); Menkel-Meadow, *supra* note 106 at 135-36 (encouraging teachers in conventional courses "to teach alternative ways of structuring and solving legal problems" and to "push students to look for multiple possibilities and directions that [a] case could have taken"); O'Leary, *supra* note 3, at 65, 94-95.

When a client brings a legal problem to a lawyer and asks for advice, one approach to dealing with the problem will usually occur to the lawyer fairly quickly. This “first thought” approach may be obvious or subtle. It may be the standard approach; it may be the approach the lawyer used before; it may be the least costly approach; it may be the easiest approach. Whatever its merits, this “first thought” approach has one significant drawback. The first thought may stifle any second thought or third thought. Rather than attempting to think of alternatives, the lawyer may focus efforts on perfecting and implementing the first thought.

Novice lawyers in particular need to resist this impulse. The first thought may possibly be the best, but there is no way of knowing that unless the lawyer has second and third thoughts as well. . . . The assumption that the first thought approach isn’t available is important because it forces the lawyer to think seriously about other alternatives.<sup>231</sup>

Accordingly, students (and novice lawyers) are urged to suspend judgment and create hypotheses about alternative solutions to the problem by “reverse thinking, random stimulation, developing original analogies, and brainstorming.”<sup>232</sup> In fact, students’ inexperience is considered a value because their “freshness . . . [can] generate creative solutions to problems that more seasoned attorneys might overlook in favor of well-worn habits.”<sup>233</sup>

Although no one can dispute the virtues of teaching students to develop creative, alternative solutions to legal problems, the cognitive psychology studies raise serious questions whether encouraging students to engage in brainstorming and similar techniques achieves that goal. Obviously, because most students are hampered by their limited knowledge of the law and inexperience, their ability to engage in extensive brainstorming in a simulation or clinical course is very limited and can be very time-consuming.<sup>234</sup> But more importantly, the studies suggest that teaching students to use routinely hypothetico-deductive problem-solving techniques trains them in the less efficient and effective methods of backward reasoning.<sup>235</sup>

As discussed previously, research in the field of medical educa-

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<sup>231</sup> HAYDOCK ET AL., *supra* note 230, at 26.

<sup>232</sup> McDonnell, *supra* note 230, at 309.

<sup>233</sup> See Katherine R. Kruse, *Biting Off What They Can Chew: Strategies for Involving Students in Problem-Solving Beyond Individual Client Representation*, 8 CLIN. L. REV. 405, 427 (2002).

<sup>234</sup> See *id.* at 427 (2002) (observing in regard to clinical courses, “By limiting the students’ work to a single type of case, area of law, or small number of clients, law school clinics can make the time and space for the students’ learning curve to catch up with the creativity of their imaginations.”).

<sup>235</sup> See *supra* notes 162-68 and accompanying text.

tion shows that doctors trained in programs that encourage the routine use of brainstorming alternative hypotheses and elaboration on each aspect of a diagnosis are prone to backward reasoning in their practice.<sup>236</sup> Especially when they have an inadequate grounding in basic biomedical concepts, students in these programs have the tendency to consider a greater amount of irrelevant information and to render inaccurate diagnoses compared to their counterparts trained in conventional programs.<sup>237</sup> These studies suggest that law students who are taught to use brainstorming as a regular method for problem solving may become prone to backward reasoning in their practices.<sup>238</sup> While in some difficult or out-of-the ordinary cases, exacting deductive reasoning, involving full-fledged hypotheses generation and evaluation may be required, the use of such an approach on a routine basis can be highly inefficient and ineffective.<sup>239</sup> Providing students with a firm doctrinal base and training them how to use that knowledge to organize their practical experience may be more helpful in training them for the forward reasoning required in regular practice.<sup>240</sup> In other words, it may be better to teach students how to develop effective "first thoughts" about different cases than how to brainstorm second and third thoughts about cases in a subject area in which they lack adequate domain knowledge. Understanding the problem may be more important than developing alternative hypotheses for solving it.

Moreover, the psychological studies indicate that teaching brain-

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<sup>236</sup> See *id.*

<sup>237</sup> See *supra* note 166 and accompanying text.

<sup>238</sup> A distinction exists, of course, between the impact of a curriculum with a few skills courses encouraging the routine use of a backward reasoning approach and the effect of an entire curriculum geared to teaching problem-solving methods. Empirical research would be necessary to assess the differences. The possible negative effects of only a few such courses, however, cannot be downplayed if students' only exposure to skills training encourages the use of hypothetico-deductive methods.

<sup>239</sup> In an often-quoted passage, Donald Schon, a distinguished professor of education at Massachusetts Institute of Technology gave some anecdotal evidence of the number of cases handled by physicians that they consider out-of-the ordinary: "Doctors do vary about what this percentage is: I have never heard it lower than thirty percent or higher than eighty percent, but I have heard it put at eighty percent by someone whom I regard as a very good doctor." Donald A. Schon, *Essay: Educating the Reflective Legal Practitioner*, 2 CLIN. L. REV. 231, 239 (1995). These data, however, do not support teaching students brainstorming and other heuristic devices as the normative approach to legal problem solving. Taking the midpoint between Schon's thirty and eighty percent, at least half of most physician's caseloads are "by the book" and can be addressed by standard expert forward reasoning. More importantly, these data do not show that the best method for *teaching* problem solving to novice practitioners, especially those with a limited knowledge base, is training them in these techniques. While students certainly need to be aware of the dangers of "scripted" practice and the values of deductive techniques in some cases, they also need to learn the importance of developing their forward-reasoning skills.

<sup>240</sup> See *supra* notes 169-76 and accompanying text.

storming and similar techniques to law students without adequate doctrinal knowledge may actually impede skills acquisition. As described previously, if an instructional format places too heavy a cognitive load on students, their learning will be adversely affected.<sup>241</sup> With law school skills training courses, if students are asked to brainstorm or use other problem-solving techniques in doctrinal areas in which they have limited exposure and in which they must perform extensive legal research, these studies suggest that the burden on their mental processes may actually obstruct learning both the doctrine and the techniques. Brainstorming alternative theories of liability in a negligence case certainly makes substantially more cognitive demands on a law student than it does on an experienced personal injury lawyer. Although such problem-solving techniques may theoretically appear advantageous to learning, they have the potential for inhibiting it.

In a similar vein, research suggests that use of such heuristic devices may even impede the creative process. As the research of Mihaly Csikszentmihalyi illustrates, creative flow usually occurs when persons have a chance of completing the task.<sup>242</sup> If students lack the adequate knowledge base to engage effectively in brainstorming, the anxiety of both thoroughly researching a new area of the law and brainstorming theories within it has the potential for obstructing the creative process. Students, faced with a brainstorming assignment in an area in which they lack solid doctrinal or contextual knowledge, may feel daunted in any quest to develop “fresh” solutions to problems.

## 2. *Teaching Creative Problem Solving in the First Year*

During the past fifteen years, a number of law schools have established first-year “lawyering” courses to introduce students at the beginning of their careers to some of the essential skills used by attorneys: interviewing, counseling, and negotiation.<sup>243</sup> Some of these courses focus primarily on providing students with some of the “nuts and bolts” issues raised in performing these skills. Others, however, concentrate on training these students to become “creative problem

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<sup>241</sup> See *supra* notes 189-90 and accompanying text.

<sup>242</sup> CSIKSZENTMIHALYI, *FLOW*, *supra* note 50 at 49; see *supra* notes 114-24 and accompanying text.

<sup>243</sup> See, e.g., Margaret Martin Berry, Jon C. Dubin & Peter A. Joy, *Clinical Education for this Millennium: The Third Wave*, 7 CLIN. L. REV. 1, 41-44 (2000); Kate O'Neill, *Adding an Alternative Dispute Resolution (ADR) Perspective to a Traditional Legal Writing Course*, 1998 FLA. L. REV. 709 (1998); Franklin M. Schulz, *Teaching “Lawyering” to First-Year Law Students: An Experiment in Constructing Legal Competence*, 52 WASH. & LEE L. REV. 1643 (1996).

solvers.”<sup>244</sup> Cognitive research raises serious questions about the limits of teaching problem solving to students with such limited knowledge of legal doctrine.

A good illustration of some of the possible problems raised by lawyering courses which focus on teaching problem-solving is a first-year elective course, “Law & Lawyering in the Work Place,” described at length in an article by Alan Lerner.<sup>245</sup> Lerner asserts that, “the heart of what lawyers do is the exercise of critical judgment”<sup>246</sup> and defines the mission of the course as teaching “students to exercise critical judgment in addressing problems framed or constrained by the law, and to act creatively as transformative problem solvers, rather than solely as ‘gladiators.’”<sup>247</sup> Students in the course handled simulated workplace cases (primarily in the area of employment discrimination) and were assigned roles of one of the interested parties or counsel in each problem. The problems were constructed, Lerner notes, “so that seeking a resolution through litigation was not likely to produce a satisfactory solution.”<sup>248</sup>

Lerner acknowledges that the substantive law applicable to these cases “was complex, charged with political and emotional content, and constantly evolving.”<sup>249</sup> Indeed, the cases raised complex Title VII issues and required some understanding of recent, and evolving, Supreme Court precedent.<sup>250</sup> To address this problem, before any simulation, the instructors provided students with copies of the relevant cases so that they would “understand the law well enough to be able to use it to address the problem called for in their roles and to use the simulation as a platform from which to build further insights into the implications of the applicable legal rules.”<sup>251</sup> Factual context was provided through non-legal readings and “guest” lawyers and other professionals.<sup>252</sup>

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<sup>244</sup> Compare University of New Mexico School of Law, *Courses Descriptions: Lawyering Process*, at [http://lawschool.unm.edu/curriculum/11/descriptions/\(introduction to different lawyering skills\)](http://lawschool.unm.edu/curriculum/11/descriptions/(introduction%20to%20different%20lawyering%20skills)) with Lerner, *supra* note 3 (“Law & Lawyering in the Work Place” course focusing on teaching problem solving). See generally Menkel-Meadow, *supra* note 106, at 142 (proposing, “[i]nstead of a repetitive diet of common law courses . . . the first-year should introduce students to a variety of forms of legal reasoning and intelligences, including common law, statutory drafting and interpretation, Constitutional law . . . some introduction to another discipline . . . and some exposure to a real world legal problem . . . and some exposure to the now [*sic*] multiple intelligences of legal research . . .”).

<sup>245</sup> Lerner, *supra* note 3, at 107.

<sup>246</sup> *Id.* at 111.

<sup>247</sup> *Id.* at 112.

<sup>248</sup> *Id.* at 118.

<sup>249</sup> *Id.* at 117.

<sup>250</sup> See *id.* at 135-38.

<sup>251</sup> *Id.* at 137.

<sup>252</sup> *Id.* at 118.

While Lerner's statement of course mission is certainly admirable, his description of this course illustrates some of the potential pitfalls of teaching problem solving to first-year students, especially in the context of complex legal cases. The model for problem solving presented in this course is significantly different from the approach used by experts. As the psychological research demonstrates, experts do not approach most problems by first learning the doctrine relevant to a particular area and then applying it.<sup>253</sup> Rather, they rely on schemata developed from their experience, organized by a solid knowledge base.<sup>254</sup> Especially in an area like employment discrimination law, which raises complex issues of administrative law,<sup>255</sup> statutory interpretation,<sup>256</sup> burden-shifting,<sup>257</sup> evidentiary proof,<sup>258</sup> and expert testimony,<sup>259</sup> such a knowledge base is not attained through quickie classes and readings but through a foundation in basic tort, procedural, and evidence law, and such schemas are not developed from one or two cases. Indeed, it is hard to reconcile the course's stated mission of teaching the "exercise of critical judgment" with the assertion that students are asked to creatively problem solve each simulation after being given materials so they understand the law "well enough" to handle it.

Moreover, this course raises serious question about the cognitive load demands on the students. By requiring students to learn the complexities of employment discrimination law at the same time that they are learning "lawyering skills" in which they have virtually no experience, it is highly likely that their learning of either the doctrine or the skills is impeded.<sup>260</sup> In fact, Lerner acknowledges that a number of student evaluations of the course expressed insecurity about the inadequate foundation they received in legal doctrine and requested more discussions and lectures to help them feel comfortable with the law.<sup>261</sup> Lerner's response that he had confidence that the students did learn the applicable law does not address the issue whether they learned enough about the law or skills to transfer their knowledge into other cases. Additionally, the insecurity (anxiety) expressed at least on the part of some students could actually inhibit the student's exer-

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<sup>253</sup> See *supra* notes 74-75 and accompanying text.

<sup>254</sup> See *supra* notes 78-83 and accompanying text.

<sup>255</sup> See, e.g., 2 BARBARA LINDEMAN & PAUL GROSSMAN, *EMPLOYMENT DISCRIMINATION LAW* 1205-73 (3d ed. 1996).

<sup>256</sup> See, e.g., *id.* at 1282-89.

<sup>257</sup> See, e.g., *id.* at 13-39.

<sup>258</sup> See, e.g., *id.* at 10-44.

<sup>259</sup> See, e.g., *id.* at 88-106.

<sup>260</sup> See *supra* note 190 and accompanying text.

<sup>261</sup> Lerner, *supra* note 3, at 141.



cise of critical judgment touted as a major goal of the course.<sup>262</sup>

### 3. *Teaching Problem-Solving in Clinical Courses*

While the literature on clinical legal education is replete with suggested methods for teaching problem solving in the context of live-client clinics,<sup>263</sup> little attention has been paid to the cognitive limitations of such approaches to student learning.<sup>264</sup> As with Lerner's first-year simulation course, laudable course objectives are articulated and creative teaching approaches and assignments are described. But the issue of whether or not students are actually learning processes of problem solving that can be used in actual practice is rarely addressed.

In a recent article, for example, Mark Aaronson relies on Hannah Arendt's lectures on Kant's political philosophy to describe his goal of teaching students "practical judgment."<sup>265</sup> Lawyers who exercise such judgment, he asserts, have the ability to "see the whole situation – both the big picture and the particular details. They also tended to have an accompanying strong sense – almost an immediate sense – of what the danger points were and what were the likely options and consequences of different courses of action."<sup>266</sup> While recognizing the pedagogical problems of teaching such a fairly complicated human quality in a live-client clinic, he still maintains that "it is an objective that can be met so long as the expectations are reasonable."<sup>267</sup>

The course Aaronson describes is an individual representation, single-semester civil clinic. The clinic handles cases in a number of subject matter areas: Social Security disability appeals, rent regulation disputes, special education administrative hearings, and employee wage disputes.<sup>268</sup> Students usually have responsibility for two cases in two different subject areas.<sup>269</sup> In the clinic, students are expected to spend at least an average of sixteen hours of work each week on their cases.<sup>270</sup> Using the case experiences as the primary course material, Aaronson articulates four organizing themes for the course: "(1) lawyering as an interpersonal social activity, (2) problem solving under conditions of uncertainty, (3) the lawyer's role as an intermediary, and

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<sup>262</sup> See *supra* note 123 and accompanying text.

<sup>263</sup> See, e.g., Kruse, *supra* note 233; Andrea M. Seislstad, *Community Building as a Means of Teaching Creative, Cooperative, and Complex Problem Solving in Clinical Legal Education*, 8 CLIN. L. REV. 445 (2002).

<sup>264</sup> But see Baker, *supra* note 1.

<sup>265</sup> Aaronson, *supra* note 3, at 247.

<sup>266</sup> *Id.* at 251-52.

<sup>267</sup> *Id.* at 287.

<sup>268</sup> *Id.* at 307-308.

<sup>269</sup> *Id.* at 307.

<sup>270</sup> *Id.* at 309.

(4) the overriding significance of context.”<sup>271</sup> These themes, he contends, bear directly on the exercise of practical judgment in lawyering.<sup>272</sup>

Aaronson describes the pedagogy in the clinic as “active learning”: “almost all of what they learn in the Clinic comes from their own experiences, writings, responses to readings, and discussions with others.”<sup>273</sup> Supervision is framed around the organizing themes of the course, such as the need for both empathy and detachment with clients, as well as the development of conventional lawyering skills.<sup>274</sup> Student progress depends, Aaronson observes, on how well students can “recall and apply relevant knowledge.”<sup>275</sup>

In his evaluation of the course, Aaronson acknowledges, “[n]otwithstanding that a major objective is to help law students become problem-solving lawyers, only so much can be accomplished in a single clinical semester. *The breadth of material that has to be presented is too vast.*”<sup>276</sup> Aaronson, however, does not explain satisfactorily why this breadth has to be so vast. He suggests that the main reason for this “overload of information” is the “constant demand on students not just to act but to act reflectively.”<sup>277</sup> But he provides no rationale for the need for a clinic with multiple subject matter areas or for a course requirement that students handle cases in two different areas. Nor does he adequately explain why the demand on students to act reflectively requires the focus in a one-semester clinic on all four of his organizing themes – lawyering as a social activity; problem solving in uncertain situations; lawyer’s role as intermediary; and the importance of context – as well as conventional lawyering skills. Obviously, expert representation of a client requires the use of reflection and use of all of these skills, but given what Aaronson himself acknowledges as the “rudimentary nature” of students’ knowledge, his course description raises serious questions whether the cognitive demands of the vast nature of the material covered might actually impede the learning of reflective practice.<sup>278</sup> Aaronson, like many

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<sup>271</sup> *Id.* at 311.

<sup>272</sup> *Id.* at 311-12.

<sup>273</sup> *Id.* at 310.

<sup>274</sup> *Id.* at 312.

<sup>275</sup> *Id.* at 310.

<sup>276</sup> *Id.* at 319 (emphasis added).

<sup>277</sup> *Id.*

<sup>278</sup> While at first glance, Aaronson’s observation that the “organizing themes provide a framework for discussing issues, such as empathy and detachment, while at the same time focusing on the development of conventional lawyering skills” sounds commendable, further examination raises significant questions about the soundness of such an approach. If considered seriously, each of those issues – empathy, detachment, conventional skills – pose complex questions which require some doctrinal knowledge base (both in law and

clinicians, seems to ignore the fact that a student's learning of legal practice does not end at the completion of the course.

Most importantly, Aaronson fails to take into account adequately the role played by domain knowledge in learning "practical judgment" or reflective practice. The psychological studies described in this article clearly indicate that a knowledge base in the relevant legal doctrine is a prerequisite for the exercise of all four of Aaronson's attributes of practical judgment. Problem-solving in uncertain situations, for example, requires the ability to access a doctrinal base as a springboard for alternative solutions.<sup>279</sup> To understand context fully, a lawyer needs to know what relevant contextual information to investigate.<sup>280</sup> And even the interpersonal relationships of lawyering – lawyering as a social activity and lawyer as intermediary – is grounded in the law of professional responsibility.<sup>281</sup> Aaronson, however, barely touches on this issue. If, as Aaronson acknowledges, students' progress in the clinic depends in large part on their ability to recall and apply relevant knowledge, serious consideration must be given to their grasp of relevant legal doctrine before they plunge into extensive experiences with problem solving, analysis of context, or interpersonal relationships. As the Patel studies in medical education suggest, without assuring this knowledge base, a "practical judgment" course possibly could have the same pitfalls as the medical school PBL curriculum.<sup>282</sup> Although complete mastery of the knowledge base is obviously not required to learn practical judgment, sufficient command of relevant legal doctrine is essential.

### C. *Some Preliminary Thoughts on Taking Domain Knowledge Into Account in Skills Training*

The goals of all the skills teaching approaches that I have criti-

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human psychology) for answers.

<sup>279</sup> See *supra* notes 110-12 and accompanying text.

<sup>280</sup> See *supra* notes 99-105 and accompanying text.

<sup>281</sup> In an article urging "ecological learning" in clinical programs, Brook Baker urges co-participation of students and supervisors in handling cases:

[S]tudents learn best, in fact inevitably, through coordinated social action, through coordinated social action, through participation in the world of practice . . . [A] principal goal of legal education should be to intensify and enrich the quality of participation. As such, learning is more a process of successful enculturation to coordinated forms of behavior than it is of knowledge acquisition.

Baker, *supra* note 1, at 24-25. Cognitive psychology studies fail to support this bald assertion. Indeed, one of Baker's own authorities for this proposition recognizes that expertise requires *both* a doctrinal knowledge base and social experience. See *id.* at 25 n.91, quoting Joseph M. Williams, *On the Meaning of Legal Writing: Two Models of Growth and Development*, 1 J. LEGAL WRITING INST. 1, 13 (1991) ("The process of becoming an expert is at least as much a social process as an exercise of individual effort and intellect.").

<sup>282</sup> See *supra* notes 165-68 and accompanying text.

qued are very admirable, and students most certainly receive some benefits from their exposure to explicit problem-solving methods, introductions in their first year to lawyering issues, and clinical courses that seek to combine conventional skills and practical judgment training. All of these approaches are well thought out and cannot be dismissed lightly. Moreover, the findings of cognitive psychology research are not so conclusive that a definitive assessment of the effectiveness of any particular course or approach can be made at this time. But those findings do raise some important issues about the relationship between domain and tacit knowledge in the law that hopefully can be probed seriously with future empirical research and curricular experiments. In the meantime, however, that research suggests some tentative approaches for taking domain knowledge into account more effectively in law school skills curricula.

### *1. Development of Effective Problem-Solving Schemas*

The cognition studies described in Part II of this article demonstrate not only that domain knowledge and clinical knowledge are two distinct modes of reasoning, but that a firm knowledge in basic doctrine is essential to organizing the knowledge acquired through practical experience.<sup>283</sup> As Patel and her associates put it, "Domain knowledge informs practice, and practice, in turn, shapes knowledge."<sup>284</sup> Over time, the explicit "textbook" knowledge becomes tacit knowledge as the practitioner develops scripts for handling different kinds of problems.<sup>285</sup> The development of a professional from a novice to an expert requires the development of these schemas.

In the medical education context, Patel and her colleagues assert that an effective teacher of this script-making process "needs to be able to articulate knowledge [to medical trainees] that would normally be tacit for a practitioner not engaged in instruction."<sup>286</sup> In other words, in a specific clinical situation, the instructor should try to help students apply their concepts of basic science to the problems raised by the particular patient by making their reasoning process explicit.<sup>287</sup> For example, Patel and her associates

observed that a resident made a correct decision not to treat a pneumonia condition because he believed that it was caused by a medication that the patient had received (chemical pneumonitis). However, when questioned about how one discriminates between a

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<sup>283</sup> See *supra* notes 78-87 and accompanying text.

<sup>284</sup> Patel et al., *supra* note 4, at 76.

<sup>285</sup> *Id.* at 88; Patel & Kaufman, *supra* note 10, at 121.

<sup>286</sup> Patel et al., *supra* note 4, at 89.

<sup>287</sup> *Id.*

chemical pneumonitis and systematic pneumonia, he had difficulty articulating reasons. Through a series of questions, the expert physician was able to elicit from the resident the tacit underlying assumptions underlying his decision. The expert challenged his responses until he was able to construct a pattern of findings for discriminating between these two conditions. The team could then evaluate the decision and determine whether the patient's condition was consistent with chemical pneumonitis.<sup>288</sup>

Through the instructor's questioning, the resident was able to apply his domain textbook knowledge to the conditions of the patient and also start to develop a script for handling the problem of chemical pneumonitis. This process required both the resident's ability to access his biomedical knowledge and the instructor's capacity to train the resident how to use this knowledge to structure problem-solving scripts.<sup>289</sup> The goal of this method is to instruct students on the use of this method when confronting any new problem.<sup>290</sup>

These studies suggest that teaching effective problem solving in the law school setting requires a recognition of the crucial role played by legal doctrine in organizing practical experience.<sup>291</sup> Legal rules and doctrine are not just a "tool" in the lawyer's toolbox;<sup>292</sup> they provide the overall framework for the compartments in the box. Like their medical school counterparts, law students in clinical and other skills courses need a foundation in the domain knowledge relevant to problems that they are asked to solve. And like their medical school counterparts, clinical law teachers need to be adept at raising appropriate doctrinal questions with students about their cases so that they can begin to relate their client's problems to underlying doctrinal issues and start forming effective problem-solving scripts.

This research also has significant implications for developing ef-

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<sup>288</sup> *Id.*

<sup>289</sup> *Id.* (observing, "Experienced physicians have evolved specific heuristics that can be conveyed to medical trainees through effective clinical teaching.").

<sup>290</sup> As discussed previously, experts explicitly access their domain knowledge base when they face difficult problems. See *supra* notes 110-12 and accompanying text. For the novice or subexpert, any new problem is a difficult one and requires the use of this process.

<sup>291</sup> See also Weinstein, *supra* note 15, at 51 (observing that legal education "cannot teach skills without substance, nor usually teach that much doctrine without having students use it so they can structure it themselves").

<sup>292</sup> Kerper, *supra* note 3, at 355. In a recent article providing a good review of some of the literature on the differences in problem-solving methods for novices and experts, the authors recognize that law students in skills classes need to develop schemas for handling legal problems and identify inadequate knowledge base as one of the problems students face in acquiring these schemas. Morin & Howells, *supra* note 42, at 672, 674-75. Like other commentators, however, they minimize the importance of a strong domain knowledge base in the development of such schemas. They suggest that the problem of inadequate knowledge base can be remedied merely by the distribution to students of readings relevant to the legal context. *Id.* at 674.

fective law school skills training courses either in live client clinics or simulated lawyering programs. Instead of concentrating on teaching specific problem-solving methods, such as brainstorming and hypotheses generation,<sup>293</sup> these courses should perhaps focus students on solving problems in which they have a substantial knowledge base both in regard to the substantive and procedural legal rules. Since under the present conventional law school curriculum, the first-year foundation courses concentrate on common law doctrine and reasoning – in contracts, torts, property, and criminal law — appropriate subject matter for student cases/problems should relate to those areas rather than more complex statutory or administrative systems.<sup>294</sup> Most students, for example, should have a better knowledge base for developing scripts about simple landlord/tenant, consumer, contract disputes, negligence, or criminal cases than complex environmental, family law, administrative law, or employment discrimination cases. Students also should have a better ability to understand the procedural issues in the context of a relatively straight-forward case in a single forum than one involving multiple agency/court or state/federal fora. Moreover, the repetitive nature of some of the issues in those common law cases should give students the opportunity to apply the schemas they have started to develop in one case to their next cases.

The findings of these studies do not rule out the use of more complex cases as subject matters for skills training. They do, however, suggest the need for careful structuring of such courses. For students to develop problem-solving schemas and more expert-like reasoning skills, they first need a foundation in the doctrine underlying their cases. Because of cognitive limitations, they should not be learning this knowledge base at the same time they are learning to apply it.<sup>295</sup> Accordingly, students should not be expected in a single-semester course to acquire basic knowledge of the substance and procedure of a complex legal area concurrently with their handling of cases in that area. At the very least, such courses should have rigorous prerequisites in the relevant doctrine and procedural law. Ideally, they should be capstones to other doctrinal courses in the area all organized with

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<sup>293</sup> See *supra* notes 230-33 and accompanying text.

<sup>294</sup> For a general discussion of the importance of the basic first-year doctrinal curriculum to the training of practitioners, see generally Harry T. Edwards, *The Growing Disjunction Between Legal Education & The Legal Profession*, 91 MICH. L. REV. 2191, 2194 (1993).

<sup>295</sup> See *supra* notes 234-37 and accompanying text. Indeed, in my own experience, I have found that without an adequate knowledge base, students merely parrot methods I have taught them in a previous case rather than learn the process for developing their own problem-solving scripts. Cf. Weinstein, *supra* note 15, at 50 (noting that law students learn less from hearing how an experienced lawyer handles a particular problem than learning how to do the hard work themselves).

the intent of training students to apply their knowledge in practice.<sup>296</sup>

The cognition research also indicates that the need for a knowledge base may not be alleviated by simply "giving the students the applicable law." Some simulated courses provide students with sections of applicable law before they handle a problem in a particular area,<sup>297</sup> and some clinical teachers attempt to address students' inadequacy in domain knowledge with intensive orientation classes before the beginning of the semester.<sup>298</sup> Such an approach probably can provide students with an adequate foundation for the performance of particular skills (for example, witness examination in a trial advocacy course) or for routine case tasks (for example, filing papers). But it is unlikely that this approach can effectively teach legal problem-solving skills. The development of problem-solving schemata requires a more extensive knowledge base than that provided by a few pages of relevant statutory or case materials or a mini-course front loaded at the beginning of a clinical course. Most actual client problems do not fit neatly into a package of materials, and only adequate knowledge of domain principles is going to assist a practitioner in developing problem-solving abilities.<sup>299</sup>

Finally, these studies may have important implications for those instructors who want to teach their students to understand the political, economic, sociological, or psychological context of their client's

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<sup>296</sup> For an example of such a course, see UCLA School of Law, *Course Description: Law 444: Clinical: Mergers and Acquisition Transaction*, at <http://www.law.ucla.edu/students/academicinfo/coursedescriptions/clinicalmergersandacquisitionspower.html> (describing simulation course in which students represent parties in a mergers and acquisition transaction after taking courses in Business Associations and preferably Securities Regulation and Mergers and Acquisitions).

In a recent article discussing the advantages and disadvantages of students handling big cases in clinics, the author acknowledges that "[s]tudents who are not able to quickly master the file, absorb the case history, understand the client and grasp the necessary law and procedure, are too easily relegated to observer status." Nancy M. Maurer, *Handling Big Cases in Law School Clinics, or Lessons from My Clinic Sabbatical*, 9 CLIN. L. REV. 879, 892 (2003). She fails to recognize, however, that most students fall into this category. Even in a two-semester clinical program, most students may face significant cognitive problems not only mastering the file and case history, but acquiring a sufficient knowledge base of the underlying doctrinal law and procedure to apply it in practice.

<sup>297</sup> Kenneth S. Broun, *Case File: Green v. Hall & Rose*, in PROBLEMS & CASES IN TRIAL ADVOCACY (Kenneth S. Broun & James H. Seckinger, eds. 4th ed. 1993) (National Institute of Trial Advocacy Fair Housing Act problem providing students with applicable statutes and memorandum of law).

<sup>298</sup> See, e.g., Jacqueline St. Joan, *Building Bridges, Building Walls: Collaboration Between Lawyers and Social Workers in a Domestic Violence Clinic and Issues of Client Confidentiality*, 7 CLIN. L. REV. 403, 412 (2001) (intensive five-day orientation for a domestic violence clinic).

<sup>299</sup> See Patel & Kaufman, *supra* note 10, at 121. Even a routine eviction case, for example, may raise issues of lease construction, implied warranties, predicate notices, and propriety of service.

cases.<sup>300</sup> Obviously, these issues are important and are relevant to the overall problem-solving process. But that does not mean that all clinical courses can address them. The research on cognitive load demonstrates the limits on the amount that a student can learn at any given time. Given the cognitive demands of learning how to structure practical experience with domain knowledge,<sup>301</sup> it is questionable whether students handling a particular client's case have the ability – at least initially – to engage in problem solving the legal issues and, at the same time, reflect extensively on the nonlegal context of the case. In designing a course that raises these contextual issues, an instructor should consider ways of addressing this problem, such as selecting cases in a fairly simple subject matter area; concentrating on a very limited, repetitive type of case within that area; focusing on only one or two specific aspects of the cases; scheduling the course over a period of more than one semester to provide students with the space to consider these issues; or introducing the contextual issues only after students have begun to develop problem-solving schemas.

## 2. *Creating the Environment for Creative Problem Solving*

The studies on creativity described in Part II also suggest that domain knowledge may be more essential to creative problem solving than exhortations to be reflective or techniques to promote “thinking outside the box.” These studies demonstrate that creative products are usually the outgrowth of the creator's knowledge in the domain, not some revelation from heaven.<sup>302</sup> Additionally, they show that inadequate domain knowledge can actually have a negative effect on the creative process.<sup>303</sup> Faced with a problem to be solved and an insufficient knowledge base, the practitioner can become quite anxious and paralyzed, and this stress will most likely undermine creative performance.<sup>304</sup>

These findings have several important implications for teaching creative problem-solving in law school skills courses. First, they suggest that the actual cases or simulated problems used as course material must take into account the level of the students' domain knowledge. A number of creativity studies have shown that the “flow experience” that results in creative productivity occurs when individuals feel they actually have a chance of completing the task at hand.<sup>305</sup>

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<sup>300</sup> See *supra* notes 33-34.

<sup>301</sup> See *supra* notes 65-66 and accompanying text.

<sup>302</sup> See *supra* notes 70-71 and accompanying text.

<sup>303</sup> See Chapman, *supra* note 55, at 35.

<sup>304</sup> See AMABILE, *supra* note 50, at 254.

<sup>305</sup> CSIKSZENTMIHALYI, FLOW, *supra* note 50, at 49, 97.



If students feel overwhelmed by learning the basic legal doctrine relevant to the client's problem at the same time they are asked to develop fresh new insights and solutions to that problem, they are likely to become frustrated with the process and unable to experience flow. Put simply, the goals set for students in skills courses must be realistic in terms of the students' knowledge of legal doctrine and experience in the area.<sup>306</sup>

Second, creativity studies indicate that students must be given adequate time to accomplish their tasks, given their limited knowledge base. These studies demonstrate that creative products, even for experts in a field, often result only after a period of incubation, not as a bolt of lightning from the sky.<sup>307</sup> For subexperts, with limited access to domain knowledge and experience with cases, this incubation process may take much longer. Accordingly, the role of the skills teacher should be to assist students in identifying the legal doctrine applicable to a client's problem and to provide them sufficient time to develop alternative solutions.<sup>308</sup> Obviously, in live client clinics case deadlines often impede such a process, but the clinical instructor's selection of subject matter and case selection criteria should take into account these time requirements.

Finally, this research suggests that skills courses need to provide students with the proper environment to encourage creative problem-solving. The Csikszentmihalyi studies show that certain surroundings foster the creative process: those that provide easy access to the particular domain, stimulation of colleagues in neighboring offices, and supportive environment.<sup>309</sup> These findings demonstrate that instructors of skills courses who want to encourage creative thinking by their students not only need to take into account the level of domain knowledge students bring into the course but devise methods for nourishing that knowledge within the course. They should consider ways of providing easy access to information – both legal and factual – relevant to the cases or problems; methods for encouraging collegial interchange on problems; and supportive supervisory relationships. In

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<sup>306</sup> See *id.* at 97. See generally Phyllis Meltzer & Harold Feder, *Go With the Flow*, 22 L. PRAC. MGMT. 50, 54 (1996) (suggesting that “[l]egal jobs may need to be configured in such a way as to be not too easy and too impossible, so that a subordinate, seeing the assignment, can recognize the challenge of the task and not be bored by the undertaking”).

<sup>307</sup> See CSIKSZENTMIHALYI, *CREATIVITY* *supra* note 50, at 98.

<sup>308</sup> In my own experience as a clinical teacher, I have often become frustrated when a student does not immediately see what I consider to be the “obvious” solution to a client’s problem. My frustration causes more anxiety in the student, and any possibility of creativity is destroyed. Lately, I have found that it is often more helpful and actually more efficient to guide students through the doctrine and then give them time on their own to devise possible solutions.

<sup>309</sup> CSIKSZENTMIHALYI, *CREATIVITY*, *supra* note 50, at 127-45.

a live-client clinical course, for instance, instructors should consider the benefits of limiting the subject matter of cases to a single subject matter area or type of case so that all the students become steeped in the relevant domain knowledge and can work together with their colleagues and supervisors to develop innovative scripts for handling their clients' problems.

### 3. *Overcoming the Inflexibility of Scripted Practice*

As described previously, while an expert's domain knowledge is essential in developing problem-solving skills, it can also hinder effective problem solving.<sup>310</sup> The scripts used by experts can lead to inflexibility in approaching problems. And forward reasoning, by rejecting information considered irrelevant, can ignore creative solutions that might result from the less efficient process of backward reasoning.<sup>311</sup>

Although providing no definitive answers to this problem, the psychological studies suggest that the expert scripting and flexibility are not necessarily incompatible.<sup>312</sup> Both are necessary for effective problem solving. Without the proceduralization of scripts, a practitioner lacks a strategy for solution and has a difficult time beginning the problem-solving process. Without flexibility, she lacks the capacity to consider alternative solutions to difficult problems.<sup>313</sup> The practitioner who is over-scripted risks the danger of overlooking a more effective solution to the problem; the practitioner who is under-scripted but flexible may not even be able to identify the basic contours of the problem. To combine the benefits of both scripting and flexibility, the literature suggests, practitioners need to learn how to "proceduralize flexibility."<sup>314</sup> Effective problem solvers need to learn how to distinguish between those situations in which their schemas should be used and those in which routine procedures should be modified to adapt to difficult or unusual problems. Moreover, skills instructors should teach their students strategies to exploit the knowledge they have learned in more effective ways, for instance, methods for explicitly generating sets of related legal or factual theories.

In regard to skills training in the law school setting, this research indicates that instructors need to encourage a balance between entirely scripted and completely open-ended lawyering. If, on the one hand, students are taught that every case should be approached as a

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<sup>310</sup> See *supra* note 308 and accompanying text.

<sup>311</sup> See *supra* notes 309 and accompanying text.

<sup>312</sup> Frensch & Sternberg, *supra* note 57, at 180-82.

<sup>313</sup> See *id.* at 181.

<sup>314</sup> *Id.* at 182.

totally unique problem, they will not develop the skills to form efficient problem-solving schemas and to engage in forward reasoning. If, on the other hand, students are taught (as they often are in practice) that every case can be approached according to a routine script, they will not learn the skills to solve difficult and ill-structured problems. The real value of skills training in law schools, then, may not be so much to train students in special problem-solving techniques as to assist them in learning how to determine when to use schemas in problem-solving and when to adapt or modify them. As students organize their schemas by experiencing the representation of a client in a simulated or actual case, the instructor can guide them through the process of identifying both the common aspects of this particular type of legal problem and those circumstances that deviate from the routine.

The foundation for this kind of instruction is an adequate knowledge base by the students. A solid understanding of the legal rules applicable to the case assists students in not only organizing their schemas, but recognizing deviations from the doctrine. Certainly this kind of teaching can and should take into account emotional, economic, and political factors in the client's situation. But, as the studies discussed in this article suggest, effective problem solving in practice does not begin with a consideration of those factors. Rather, it starts only after a firm understanding of domain knowledge.

### CONCLUSION

This article has reviewed some of the recent studies in cognitive psychology on the problem-solving and creative processes in an attempt to develop some tentative thoughts on effective methods for teaching problem-solving in law school skills courses. As is apparent from the description of these studies, their findings are not entirely definitive and at times are even contradictory. Moreover, a serious question can be raised whether this research, especially the studies on medical education and practice, is even relevant to legal problem solving and the instruction of law students. Indeed, this article has demonstrated the need for more extensive empirical studies into the reasoning process of lawyers and the relation of doctrinal and skills training in law schools.

One conclusion of the psychological research, however, seems fairly clear: the nervous system has definite limits on the amount of information it can process at any given time. For that reason, psychologists hypothesize that experts develop schemas to solve problems and disregard information they consider irrelevant. And because of cognitive load theory, other psychologists suggest that complex prob-

lem-solving heuristics actually can hinder effective problem solving. Finally, relying in part on this theory, Patel and her associates hypothesize that medical students trained in curricula combining the instruction of domain and clinical knowledge are less effective diagnosticians than those trained in conventional curricula in which students first obtain training in the biomedical sciences and then engage in clinical practice.

Even with all the limitations of the psychological research and the problems with applying this research to the legal setting, cognitive load theory has important implications for skills training in law schools. Put simply, significant limitations exist on the amount of information that can be processed by a student in learning legal problem solving in a skills course. Skills teachers need to be honest with themselves and understand that in a one or two semester course educational goals must be pared back and that all aspects of the problem-solving process cannot be addressed at the same time.<sup>315</sup>

This article has argued that an essential aspect of this process is an adequate level of knowledge of the applicable legal doctrine. Before a novice lawyer can embark on solving any legal problem, she has to have a knowledge base to organize her experience, to communicate her ideas to others, to rely on for handling difficult situations, and to develop creative solutions. Although no one would dispute the value of teaching students to consider psychological, political, and economic factors in this process, an inordinate amount of attention has been paid to those issues in recent skills-training literature. Given the crucial role played by domain knowledge in problem solving and the limits of students' cognitive load, this article proposes that skills training curricula place a high priority on training students how to use their doctrinal training to become effective and creative legal problem-solvers.

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<sup>315</sup> See Aaronson, *supra* note 3, at 286.

