THE PEDAGOGY OF PROBLEM SOLVING: APPLYING COGNITIVE SCIENCE TO TEACHING LEGAL PROBLEM SOLVING

LARRY O. NATT GANTT, II†

I. INTRODUCTION

Over the last five years, the legal education system has faced a new call for instructional transformation as legal academics and law school regulators forge a fresh debate over how law schools should educate their students.1 Books such as the Carnegie Foundation’s Educating Lawyers and Best Practices for Legal Education, published by the Clinical Legal Education Association, ignited much of this recent discussion.2 The American Bar Association (“ABA”) then fueled the debate as it undertook a comprehensive review of its Standards for Approval of Law Schools, including the standards relating to the law school curriculum.3

† Professor and Associate Dean for Student Affairs, Regent University School of Law; M.Div., Gordon-Conwell Theological Seminary, 2000; J.D., Harvard Law School, 1994; A.B., Duke University, 1991. I would like to thank William Magee and Eric Bensinger for their research assistance in writing this Article. I would also like to thank Regent University School of Law and the American Center for Law and Justice for their funding of this research.

1. As evidence of the importance of this debate, the 2012 Annual Meeting of the Association of American Law Schools included an all-day workshop on the “Future of the Legal Profession and Legal Education: Changes in Law Practice: Implications for Legal Education.” See AALS Workshop on the Future of the Legal Profession and Legal Education: Changes in Law Practice: Implications for Legal Education, Ass’n Am. L. Sch. (Jan. 5, 2012), https://memberaccess.aals.org/eweb//DynamicPage.aspx?webcode=TrkDetails&trk_key=87c1c971-1837-495a-bd43-59ffe07827ef. This workshop included specific sessions on innovations in legal education and in law teaching. Id. Another example of how the debate is taking shape is the development of Educating Tomorrow’s Lawyers (“ETL”), an initiative staffed and based at the Institute for the Advancement of the American Legal System at the University of Denver. See Educating Tomorrow’s Lawyers, Inst. for Advancement Am. Legal Sys., http://educatingtomorrowslawyers.du.edu/ (last visited Aug. 28, 2011). The mission of ETL is “[t]o encourage and facilitate innovation in legal education in order to train new lawyers to the highest standards of competence and professionalism,” and ETL has partnered with a consortium of law schools that are “committed to innovation in the spirit of the Carnegie Report.” Id.


Legal education has traditionally focused on instructing students how to "think like lawyers," but this recent discussion has placed increased emphasis on other instructional goals, including emphasis on how law schools should teach their students to be effective "problem solvers." 4 Although thinking like a lawyer has always involved, at its core, problem solving, law schools and legal education regulators are increasingly highlighting the development of problem solving skills in students as an explicit instructional goal of legal curricula. 5 Standard 302 of the ABA Standards and Rules of Procedure for Approval of Law Schools covers curriculum and currently provides that law schools "shall require that each student receive substantial instruction in . . . problem solving." 6 The proposed revisions to Standard 302 add that law schools shall establish "learning outcomes" for their students and that one of these outcomes shall include "competency as an entry-level practitioner in the . . . professional skills of . . . problem solving [among others]." 7

One important step in this developing emphasis occurred when Harvard Law School, the founding institution behind the traditional case-method instructional model, instituted significant reforms to its curriculum in 2006. 8 Among other changes, the school adopted a first-year course currently titled "Problem Solving Workshop," which fo-

4. See, e.g., STUCKEY ET AL., supra note 2, at 57 n.211 (reasoning that "helping students become effective and responsible problem-solvers is the primary goal of legal education").


6. 2011-2012 STANDARDS AND RULES OF PROCEDURE FOR APPROVAL OF LAW SCHOOLS 20 (ABA Section of Legal Educ. & Admissions to the Bar ed., 2011), available at http://www.americanbar.org/content/dam/aba/publications/misc/legal_education/Standards2011_2012aba_standards_chapter3.authcheckdam.pdf [hereinafter ABA Standards]. Interpretation 302-2 adds "problem solving" as one of the "areas of instruction in professional skills that fulfill Standard 302(a)(4)." Id. at 21. That standard requires law schools to mandate that each student obtain "substantial instruction" in "professional skills generally regarded as necessary for effective and reasonable participation in the legal profession." Id. at 20.


8. See HLS Faculty Unanimously Approves First-Year Curricular Reform, HARVARD L. SCH. (Oct. 6, 2006), http://www.law.harvard.edu/news/2006/10/06_curriculum.html; see also Sacha Pfeiffer, Twas a Time for Change, Bos. GLOBE, May 7, 2006, http://www.boston.com/business/articles/2006/05/07/twas_a_time_for_change/.
cuses on "complex problem solving" and allows students to "work on a complex problem (or problems) beyond the bounds of any single doctrinal subject, explored through simulation and team work." This curricular change recognizes a significant shift from the traditional case-method model; and other law schools have adopted, or are considering, similar changes to emphasize problem solving and skills development in their curriculum.

In fact, since the 1970s, legal education has experienced enormous growth in the number of courses devoted to teaching law students practical skills, like legal research, oral advocacy, and negotiations. Many of these skills courses include instruction in problem solving, particularly many of the first-year "lawyering" courses, which teach skills such as creative problem solving. Law schools also instituted clinical programs in order to provide opportunities for students to apply their analytical skills in a real-life context.

9. HLS Faculty Unanimously Approves First-Year Curricular Reform, supra note 8; see also Elaine McArdle, A Curriculum of New Realities, HARVARD L. BULL., Winter 2008, available at http://www.law.harvard.edu/news/bulletin/2008/winterfeature_1.php (discussing new curriculum); Problem Solving Workshop 1, HARVARD L. SCH., http://www.law.harvard.edu/academics/curriculum/catalog/index.html?o=14952 (last visited Aug. 31, 2011) (“The course is intended to help prepare you for the actual practice of law by allowing you actively to engage in the sorts of discussions and activities that occupy real lawyers every day, combining their knowledge of law with practical judgment to help clients attain their goals within the bounds of the law.”).


11. In a November 2005 article in the AALS Newsletter, N. William Hines, then president of the Association of American Law Schools (“AALS”) listed the increase in professional skills training in law schools as the fourth most important change in legal education in the last 25 years. See N. William Hines, Ten Major Changes in Legal Education Over the Past 25 Years, AALS News (Ass’n Am. L. Sch., D.C.), Nov. 2005, available at http://www.aals.org/services_newsletter_presNov05.php; see also Robert MacCrater, Symposium on the 21st Century Lawyer: Keynote Address—The 21st Century Lawyer: Is There a Gap to be Narrowed?, 69 WASH. L. REV. 517, 520 (1994) (“The growth of skills and values curriculum in law schools during the 1970s is unquestionably the most significant development in legal education in the post-World War II era.”).


Many of these clinical courses include explicit instruction in problem solving.14 Similarly, many law schools have instituted academic support programs ("ASPs") that emphasize teaching skills like problem solving that make students successful in law school and in their future careers.15 In sum, a survey of curricular offerings at ABA approved law schools reveals that 113 schools, or 56.5% of schools approved to confer the J.D. degree, now make explicit reference to “problem solving” in their course or program descriptions available online.16

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solving (last visited Aug. 5, 2011); The Lawyering Curriculum, Ctr Y.U.N.Y. Sch. L.,
http://www.law.cuny.edu/academics/courses/Lawyering.html (last visited Aug. 5,
2011) (describing Lawyering Seminars for first-year and second-year students); Course
including Advanced Trial Advocacy); Alternative Dispute Resolution, COLUMBIA L. Sch.,
http://www.law.columbia.edu/center_program/ad (last visited Aug. 5, 2011); Legal Aid
Clinic (Public Interest I, II, III), CORNELL U. Sch., http://www.lawschool.cornell.edu/academics/clinicalprogram/legal_clinic.cfm (last visited Aug. 5, 2011); Mission Statement,
statement/index.php (last visited Aug. 5, 2011); Academic Programs: Course Descrip-
tions, DePAUL C.L., http://www.law.depaul.edu/programs/course_descriptions.asp (last
visited Aug. 5, 2011) (providing course descriptions, including Negotiations); Applied
www.law.udc.edu/page=FullTimeCurriculum&hhSearchTerms=problem+and+solving
(last visited Aug. 5, 2011) (describing the first year as providing basic knowledge and
skills); DRAKE U.L. Sch., http://www.law.drake.edu/ (last visited Aug. 5, 2011) (provid-
ing a mission statement that includes promotion of "effective problem solving"); Cap-
id=369&all=1 (last visited Aug. 5, 2011); Centers & Clinics: Kessler-Eidson Program for
Trial Techniques, EMORY U. Sch. L., http://www.law.emory.edu/centers-clinics/centers-for-advocacy-dispute-resolution/trial-techniques.html (last visited Aug. 5, 2011); Aca-
demics, FAULKNER L., http://www.faulkner.edu/jsl/academics/default.aspx (last visited
Apr. 13, 2012); Course Descriptions, FLA. COASTAL Sch. L. 5, https://www.fcsel.edu/sites/fcsel.edu/files/FCSL%20MASTER%20COURSE%20LIST%2010-28-2010.pdf (last visited Aug. 5, 2011) (providing course descriptions, including one for Comprehensive Law
.shtml (last visited Aug. 6, 2011) (making problem solving part of the school's mission
statement); Law & Business, FLA. St. U.C.L., http://www.law.fsu.edu/law_economics/in-
dex.html (last visited Aug. 6, 2011); Course Descriptions, FORDHAM U. Sch. L., http://
law.fordham.edu/16158.htm (last visited Aug. 6, 2011) (providing course descriptions,
including one for Corporate Counseling Fundamentals); Small Business Planning Semi-
nar, GEORGIA MASON U. Sch. L., http://www.law.gmu.edu/academicrecords/programs/cur-
culum/coursedescriptions/environmental_law—nepa_esa_caa_cwa.asp (last visited Aug. 6,
2011); Degree Requirements, GEORGE WASHINGTON L. Sch., http://
www.law.gwu.edu/Academics/degrees/JD/Pages/DegReq.aspx (last visited Aug. 6, 2011)
(describing the degree requirements including a Professional Skills Requirement); Ge-
orgetown-Hewlett Program in Conflict Resolution and Legal Problem Solving, Ge-
6,2011); Business Law and Ethics Program, U. GA. Sch. L., http://www.law.uga.edu/ 
business-law-and-ethics-program/ (last visited Aug. 6, 2011); Consortium on Negotiation
and Conflict Resolution, GA. St. U.C.L., http://law.gsu.edu/cncr/index.html (last visited
Aug. 6, 2011); Course Catalog, GOLDEN GATE U. Sch. L., http://www.ggu.edu/courses/
catalog/browse_law.do (last visited Aug. 6, 2011) (providing course descriptions, includ-
ing one for LAW 801E - Legal Analysis); ENVIRONMENTAL LAW: NEPA, ESA, CAA & CWA,
GONZAGA U. Sch. L., http://www.law.gonzaga.edu/Academic-Program/curriculum/
course.descriptions/environmental_law—nepa_esa_caa_cwa.asp (last visited Aug. 13,
course descriptions, including one for Practice, Problem-Solving and Professionalism);
Course Catalog, HARVARD L. Sch., http://www.law.harvard.edu/academics/courses/2010-
11?id=8295 (last visited Aug. 6, 2011) (providing links to course descriptions, including
one for Problem Solving Workshop); JD Program Student Learning Outcomes, U. HAW.
MA`ANOA Sch. L., http://www.law.hawaii.edu/content/jd-program-student-learning-out
comes (last visited Aug. 6, 2011); Office of Academic Records: Programs of Study, HOP-
STRA U. Sch. L., http://lawarchive.hofstra.edu/academics/academicrecords/programs-of-
Criticism of the traditional case method of instruction is not new. Lawyers, even legal academics, often complain that law schools do not adequately prepare students for the daily realities of law practice. According to Emily A. Spieler, Dean of Northeastern University School of Law:

The case method’s claim to fame was that it taught people how to think like a lawyer in terms of critical analysis and
understanding the way in which the judicial process resolves issues, but it falls pretty far short of actually training people to know how to be a lawyer.  

Similarly, Stephen J. Friedman, President of Pace University and former Dean of Pace Law School, has written:

The classical paradigmatic relationship between legal education and training to be a lawyer is simple: the most important function of law school education is to teach its students to think like lawyers, and law firms will do the rest. I do not gainsay the importance of learning to think like a lawyer. At the same time, what is ordinarily meant by “thinking like a lawyer” is a mode of analytical thinking that does not include a host of other purely intellectual skills that are important parts of the armament of a successful lawyer.

Other legal educators have further underscored that the recent emphasis in legal education on the development of students' practical skills has overlooked a needed emphasis on developing the underlying intellectual skills central to legal problem solving.

Indeed, if legal education is to educate students in how to be expert legal problem solvers, it must do more than teach doctrine because future lawyers must be self-learners as they solve the legal problems they encounter in practice. Legal instruction in skills, in turn, should concentrate on cognitive skills like problem solving, not just practical skills like writing or oral advocacy, because the cognitive skills are foundational to the others. Moreover, teaching important skills builds students' self-confidence, and research has shown that law students' self-confidence enhances their academic performance.

18. Pfeiffer, supra note 8.
19. Friedman, supra note 17, at 84.
20. E.g., Anthony G. Amsterdam, Clinical Legal Education—A 21st Century Perspective, 34 J. Legal Educ. 612, 612 (1984) (reasoning legal education has “failed to develop in students ways of thinking within and about the role of lawyers—methods of critical analysis, planning, and decision-making which are not themselves practical skills but rather the conceptual foundation for practical skills and for much else, just as case reading and doctrinal analysis are foundations for practical skills and for much else”).
22. See Gantt, supra note 5, at 422-23.
Several legal scholars have discussed problem solving and its relevance to legal education. In much of this discussion, scholars have offered an expansive definition of the skills law students should develop in order to solve legal problems. Many have used the term "creative problem solving" to stress how solving clients' problems often requires non-legal and multidisciplinary approaches. Others have presented broad approaches to problem solving that are intended to apply in various contexts, legal and otherwise. What is not compre-
hensively analyzed in these discussions is the heart of legal problem solving skills, the analytical and critical thinking skills that make up the cognitive components of thinking like a lawyer. Such cognitive components include linear thinking, searching for coherence, crafting arguments, attending to detail, assessing relevance, perceiving ambiguity, dissecting thought, seeing others' perspectives, and logical thinking. In the language of educational and cognitive psychologists, what is overlooked is the basic "procedural knowledge" that is important to solving legal problems.

In this effort to equip students with the skills needed to be expert legal problem solvers, legal educators should learn from educational and cognitive psychologists' extensive examination of what it means to be an "expert" in any discipline. Experts in every discipline are characterized by the following attributes: "large, organized schematic networks within a particular domain of expertise, choosing efficiently from a large repertoire of useful strategies, quickly constructing a detailed integrated mental model of a problem, performing skills in a highly automated fashion, and carefully monitoring the difficulty of problems and one's ability to solve problems." Such research has to re-examination through values, interests, investigation and analysis of how to prevent a recurrence of the problem; Kimberly O'Leary, Using "Difference Analysis" to Teach Problem-Solving, 4 CLINICAL L. REV. 65, 81 (1997) (expanding the phase known as "solution-finding" into a sequence of investigations into how actions, which could be taken to address the client's needs, affect others). See generally WAYNE W. REEVES, COGNITION AND COMPLEXITY: THE COGNITIVE SCIENCE OF MANAGING COMPLEXITY 111 (1996); ARTHUR B. VAN GUNDY, CREATIVE PROBLEM SOLVING: A GUIDE FOR TRAINERS AND MANAGEMENT 64 (1987); Jonathan Baron, Reflective Thinking as a Goal of Education, 5 INTELLIGENCE 291, 295 (1981).

28. See Gantt, supra note 5, at 422-23.

29. Id. at 479. Relevant cognitive components also include higher order intellectual skills, such as "ends-mean thinking, information acquisition, and contingency planning." See Amsterdam, supra note 20, at 614-15. These skills are more difficult to teach than the core skills of legal analysis noted above. Developing such skills is certainly a proper goal of legal education, but it is a secondary goal behind the core skill development.

30. See Gregory Schraw, Knowledge: Structures and Processes, in HANDBOOK OF EDUCATIONAL PSYCHOLOGY 245, 249 (Patricia A. Alexander & Philip H. Winne eds., 2d ed. 2006) (defining "procedural knowledge" as "knowledge about how to do things"). Psychologists define problem solving generally as "cognitive processing directed at achieving a goal when no solution method is obvious to the problem solver." Richard E. Mayer & Merlin C. Wittrock, Problem Solving, in HANDBOOK OF EDUCATIONAL PSYCHOLOGY, supra, at 287. Problem solving involves both creative and critical thinking. Creative thinking pertains to "generating ideas that could be used to solve a problem" whereas critical thinking pertains to "evaluating ideas that could be used to solve a problem." Id. Psychologists also call "procedural knowledge," as it relates to problem solving, knowledge about "strategies." Michael Pressley & Karen R. Harris, Cognitive Strategies Instruction: From Basic Research to Classroom Instruction, in HANDBOOK OF EDUCATIONAL PSYCHOLOGY, supra, at 265, 266.

also demonstrated that experts pass through three stages in their acquisition of expertise: knowledge accumulation, knowledge integration, and automation and tuning.\textsuperscript{32} Law schools have historically focused on the first stage.\textsuperscript{33} Further examination is needed, however, on how law schools can improve their instruction in stages two and three.

In order to analyze how law schools can best teach legal problem solving, this Article draws upon the volumes of research in cognitive and educational psychology on problem solving and upon the hundreds of student evaluations since 2002 of Regent University School of Law’s Summer Academic Success Program and Academic Orientation.\textsuperscript{34} This Article operates from the assumption that legal education is, at least in significant part, about teaching students how to solve legal problems.\textsuperscript{35} From this assumption, this Article first considers the research on how problem solving skills can be taught in a way that enables students to transfer the skills to other contexts. This Article specifically looks at law school and undergraduate studies that support the contextualized teaching of problem solving skills. This Article next considers the extent to which problem solving instruction hinges on students’ doctrinal knowledge. In the analysis, it discusses studies that suggest that legal educators must provide students with a firm foundation in doctrinal knowledge, also called “domain knowl-

\begin{itemize}
  \item Learning and Instruction: Theory, Research, and Practice 247-60 (H.J. Hartman ed., 2001).
  \item Id. at 256.
  \item Amsterdam, supra note 20, at 618.
  \item As Director of Regent's Academic Success Program, I revised our Summer Academic Success Program and our Academic Orientation in 2002. In these programs, students spend their class time alternating between two components, a doctrinal component and a skills component. In the doctrinal component, professors who teach specific subject areas, such as Contracts, Torts, Property, or Constitutional Law, teach students discrete legal concepts in those areas. Students have eight classes taught by two professors in two subject areas during the Summer ASP, and they have two classes taught by one professor in one subject area during Academic Orientation. In the skills component, Gloria Whittico, Associate Director of Academic Success, and I complement the doctrinal component by using the material covered in that section as a vehicle to discuss specific skills that will enhance students' law school learning experience, such as techniques for briefing cases, outlining courses, and preparing for and taking law school examinations. Both programs also include examination on the doctrinal material covered—two exams in the Summer ASP and one in Academic Orientation. See L.O. Natt Gantt, II, Contextualizing Academic Support, Learning Curve (Ass'n of Am. Law Sch. Section on Academic Support), Fall 2009, at 7-8, available at http://www.aals.org/documents/sections/academicsupport/LearningCurve200912Fall.pdf.
  \item See Gantt, supra note 5, at 437-39. Teaching problem solving is not unique to the law school context. Educational psychologists, in fact, agree that “meaningful learning” in any discipline involves teaching students how to apply the knowledge they are learning to solve new problems. Mayer & Wittrock, supra note 30, at 289.
\end{itemize}
edge,\textsuperscript{36} before those students can most effectively learn problem solving skills. This Article then considers the role "deliberate practice" should play in teaching legal problem solving.\textsuperscript{37} This Article examines how legal education can provide students with such practice opportunities and, in turn, increase their self-regulation in the learning process. Finally, this Article recognizes that, unless hours are added to law school curricular requirements, increases in effective problem solving instruction will most likely result in decreases in doctrinal content coverage. This Article therefore concludes by discussing options for curricular change and by suggesting considerations for legal educators as they seek to find the appropriate balance between doctrinal content coverage and problem solving instruction.

II. PROBLEM SOLVING TRANSFER

Given that legal education should develop good legal problem solvers, legal education must train its students how to transfer the knowledge they learn in the classroom to new situations in a professional setting. Educational and cognitive psychologists now recognize that problem solving transfer occurs best when instructors teach students generalizable principles and strategies that can be applied to various problems.\textsuperscript{38} Specific issues regarding how best to teach knowledge transfer, however, have generated extensive discussion among educational and cognitive psychologists.\textsuperscript{39} This psychological research will first be discussed, and then relevant studies in the legal context and applications to law school pedagogy will be examined.

A. CONTEXTUALIZING PROBLEM SOLVING

In assessing knowledge transfer, a first question that arises is the extent to which education in legal problem solving should be taught in a specific doctrinal context. Educators and cognitive psychologists have considered generally this issue of whether problem solving skills need to be taught in the context of specific subject matter relevant to the goals of the instruction at issue.\textsuperscript{40} The researchers have debated whether instructors can teach "executive learning skills" such as prob-


\textsuperscript{38} RICHARD E. MAYER, LEARNING AND INSTRUCTION 28-30 (2d ed. 2008).

\textsuperscript{39} See, e.g., Mayer & Wittrock, supra note 30, at 289-99.

\textsuperscript{40} See, e.g., Susan D. Bennett, Embracing the Ill-Structured Problem in a Community Economic Development Clinic, 9 CLINICAL L. REV. 45, 65-66 (2002).
Problem solving successfully through "detached" training, where instruction concentrates on the transferable learning strategy itself, or whether students will only internalize such skills when they learn them in the context of a specific subject matter through "embedded" training. An example of such "detached" training would be a standalone course on legal problem solving, whereas an example of "embedded" training would be a Professional Responsibility course where the legal ethics rules are discussed and then are directly applied in the classroom discussion to various ethical problems.

As a general principle, the psychological research demonstrates that students more effectively learn problem solving skills when they are taught within a specific doctrinal domain as opposed to a standalone environment. Even this embedded approach, however, has two evident weaknesses that must be overcome in order to foster knowledge transfer. First, the combination of instruction in doctrine and problem solving may "disrupt processing" of doctrinal material. This issue is analyzed later in Section III. Second, because the problem solving skills are taught in a specific context, students may have difficulty perceiving how the skills can be transferred beyond the specific context in which they learned it. This issue is discussed below.

The issue of transfer and contextualization relates to a powerful movement in educational and cognitive psychology called "situated learning." Situated learning emphasizes the theory that "[m]uch of what is learned is specific to the situation in which it is learned." In several studies, researchers have found that individuals who practice specific skills, like mathematic computational skills, in real-life situations are not able at times to transfer those skills to problems in a

41. Sharon J. Derry & Debra A. Murphy, Designing Systems That Train Learning Ability: From Theory to Practice, 56 REV. EDUC. RES. 1, 26, 31 (1986).

42. Cf. id. at 26-27 (providing an example of detached training as an actual multidisciplinary college course titled "Patterns of Problem Solving" and an example of embedded training as a course on interpersonal communication that addresses strategies for solving interpersonal problems). The Harvard Law School course titled "Problem Solving Workshop" appears to be detached training. See supra notes 8-9 and accompanying text.

43. Mayer & Wittrock, supra note 30, at 299.

44. Derry & Murphy, supra note 41, at 31.


47. Id.
school context. On the other hand, researchers in other studies have found that the individuals were able to transfer learning across contexts. For instance, numerous studies have found modest to sizeable correlations between school achievement and work performance, even after controlling for the effects of general ability measures.

Educational experts have determined that the effectiveness of context-bound learning depends on the type of knowledge being acquired and the way the material is studied. From this general proposition, researchers have found that knowledge is more context-bound when it is taught in just a single context. Furthermore, researchers have identified other variables that affect the amount of knowledge transfer. First, studies have shown that transfer is a function of the degree to which the transfer task and target task share cognitive and symbolic elements. Second, studies have indicated that transfer increases by increasing the number of analogs from one to two and by suggesting that problem solvers look to the transfer task in finding a solution to the target task. Several studies have drawn from these conclusions and found that instructors can improve transfer when they provide students with multiple examples and explicitly encourage students to reflect on how the knowledge might be transferred. Indeed, this explicit encouragement seems important as further research has confirmed that learning is enhanced by the instructor's facility in creating an environment in which learners feel safe to discuss, evaluate, and experiment with the concepts being taught such that they have a self-conscious awareness of transferability issues.

48. Id. at 6 (analyzing studies discussed in Jean Lave, Cognition in Practice, Mind, Mathematics, and Culture in Everyday Life (1988) and T.N. Carraher et al., Mathematics in the Streets and in the Schools, 3 Brit. J. Developmental Psychol. 21 (1985)).
49. Anderson et al., supra note 46, at 6.
51. Anderson et al., supra note 46, at 7-8.
55. Anderson et al., supra note 46, at 7.
56. See Bennett, supra note 40, at 66-67 (citing Amy Edmondson et al., Speeding Up Team Learning, Harvard Bus. Rev., Oct. 2001, at 125). Edmondson and her co-authors also underscore the importance of team-building to learning, but her supporting study goes more to how team learning can best be structured than to arguing that team
A related research focus has been the extent to which the “training by abstraction” in traditional classroom settings benefits learning versus training in a clinical or apprenticeship context. Although educational psychologists have lauded the benefits of clinical training, researchers have found that, in certain instances, abstract instruction can result in successful transfer while clinical, or “concrete,” instruction can result in a failure to transfer.\(^{57}\) Educational psychologists John Anderson, Lynne Reder, and Herbert Simon thus offer a framework for assessing whether abstract or concrete instruction is to be preferred:

If abstract training is given, learners must . . . absorb the money and time costs of obtaining supplemental training for each distinct application. But if very specific training is given, they must completely retrain for each application. Which is to be preferred, and to what extent, depends on a balance among (a) the cost of the more general abstract training, (b) the cost of the specific training, (c) the cost of the supplemental training, and (d) the range of jobs over which the learner is likely to have occasion to apply what was learned. Someone who will spend years performing a single set of very specific tasks might be well advised to focus on specific training. But if the cost of supplemental training is not large (i.e., if there is substantial transfer over range of tasks), if technological or other changes are likely to alter tasks substantially over the years, of if the range of tasks the learner is likely to address over time is substantial, then abstract training with supplemental applications training is clearly preferable.\(^{58}\)

In this debate, many cognitive psychologists add that learning occurs best when instructors combine abstract instruction with concrete examples illustrating the principles from that instruction.\(^{59}\) Some add that this hybrid approach is particularly effective when students would be required to apply the principles in a variety of often unpredictable real-world tasks.\(^{60}\)

On the type of concrete illustrations that should be used, cognitive psychologists have discussed whether such illustrations should be “authentic” problems such as those the students might face in everyday life. Some have advocated for the use of such problems.\(^{61}\) Others

\(^{57}\) Edmondson et al., supra, at 127-32.
\(^{58}\) Id.
\(^{59}\) Id. at 8-9.
\(^{60}\) See, e.g., John Seely Brown et al., Situated Cognition and the Culture of Learning, EDUC. RESEARCHER, Jan.-Feb. 1989, at 34; Richard Lesh & Susan J. Ramon, Trends, Goals, and Priorities in Mathematics Assessment, in AMERICAN ASSOCIATION FOR
have similarly argued that students learn best when they face complex, social problems that reflect real-life situations.\(^6\) In contrast, others have responded that such authenticity is not critical and that the main goal should be to motivate students so that they are engaged in the underlying cognitive processes that will transfer.\(^\text{63}\) They similarly contend that learning need not be situated in complex, social problems because substantial research supports the conclusion that learning is more effective when specific, relevant tasks are isolated as much as possible from the main task; but they add that learning in a complex, social context may be important to motivate students so they can see how their learning applies in such a context.\(^\text{64}\)

B. Pedagogical Implications

From this review of the foundational research in educational and cognitive psychology, the question arises of which specific instructional strategies in the law school context lead most effectively to problem solving transfer. Relevant studies have often taken place in the context of evaluating the academic support programs ("ASPs") of undergraduate institutions and law schools.\(^\text{65}\) The growth of ASPs in both the undergraduate and law school contexts has been extensive.\(^\text{66}\) They serve as ripe environments to assess problem solving development because many such programs specifically seek to improve students' skills related to problem solving and critical thinking.\(^\text{67}\)
Studies in the undergraduate context are first discussed briefly and then studies in the law school context are analyzed.

1. Undergraduate Studies

Colleges began offering academic support as early as the late 1800s, and these efforts expanded in the 1950s and 1960s as many such programs began to address students' emotional as well as academic needs and began to target minority students. Numerous studies have examined the effectiveness of such programs at the undergraduate level. Some studies have found that they benefited the academic performance of the participants but that the participants still experienced high levels of anxiety. Others have found that college ASPs are most successful when they address not only students' academic needs but also their social and cultural needs. In a comprehensive survey of this research on such programs, Mary E. Levin and Joel Levin concluded that "virtually every successful" ASP designed to increase retention of at-risk minority students focused on developing students' study skills and tactics for test preparation and did so within an "integrated model wherein domain-specific skills are taught in conjunction with the courses that students are currently taking." This model of integration relates directly to the studies of ASPs in the law school context discussed below.

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70. Cao & Nietfeld, supra note 69, at 32-33.
72. Mary C. Levin & Joel R. Levin, A Critical Examination of Academic Retention Programs for At-Risk Minority College Students, 32 J. C. STUDENT DEV. 323, 327 (1991); see also Paul T. Wangerin, Law School Academic Support Programs, 40 HASTINGS L.J. 771, 773-74 (1989) (reasoning that undergraduate programs "have been at least somewhat effective"). Kulik's study found that the effect of undergraduate academic support programs "ranged in magnitude from high positive to moderate negative in the total pool of studies." Kulik et al., supra note 68, at 401-03. It found a number of factors were "significantly related to GPA" and concluded "GPA effects were higher for newer programs, for programs that did not involve remedial or developmental studies, [and] when the GPAs came from the first year of college." Id.
73. See Knaplund & Sander, supra note 69, at 203.
2. Law School Studies

a. UCLA Program

Studies of law school ASPs have similarly pointed to the importance of linking academic support to doctrinal course material.\textsuperscript{74} In their landmark work in the field of academic support, Kristine Knaplund and Richard Sander studied the effectiveness of various academic support initiatives at UCLA School of Law, including a summer program, a first-spring course, tutoring, exam workshops, review sessions, a probation course, and faculty-led study groups.\textsuperscript{75} Of these initiatives, the one found to have the greatest effect on students' long-term academic performance was the first-spring course.\textsuperscript{76} This course was a three-credit course offered to first-year students in their spring semester. In the course, instructors taught the students various learning skills using examples from the material the students were covering in their doctrinal courses.\textsuperscript{77} Although Knaplund and Sander were not able to isolate all the variables that distinguished the first-spring course from their other initiatives, the authors reasoned that the course’s success could be traced to the fact that it taught “specific
skills in a concrete and familiar substantive context." 78 They specifically emphasized the fact that the skills were taught in the context of courses the students were taking at that time. 79 They also highlighted that the two features of all the UCLA programs that had long-term academic effects were programs that focused on learning methods, like techniques for how to prepare for examinations, and that integrated such discussions into the substantive course work. 80

Knaplund and Sander compared these results with their analysis of the summer component of UCLA’s academic support program. Their summer program was held for two weeks almost immediately before the fall semester began. 81 All diversity students were invited to participate in the program, and then of those who applied, selection was based on the weakness of an applicant’s academic indicators, including an admissions amalgam of LSAT and grades and other factors indicating that the student was likely to benefit from the program. 82 The students attended ten two-hour lectures, led by nine UCLA faculty members. After two introductory lectures on the legal system, the lectures addressed cases with a common subject matter. Students participated in the discussions and, over the course of the two weeks, completed eight writing assignments (ranging from 200 to 400 words) that built upon the themes from the previous day’s lectures. Faculty members evaluated the papers and provided same-day feedback. 83 Students furthermore attended three or four workshops on how to take exams, and they completed three exams, one under timed conditions. 84 Finally, students attended sessions that addressed nonacademic aspects of law school, and they attended social activities in order to familiarize themselves with each other and with the law school experience. 85

Knaplund and Sander found that, despite the “wide array of interlocking, well-supported, and carefully conceived purposes” of the pro-

78. Id. at 174. Knaplund and Sander opined that the small class size also contributed to the class success, both because it enhanced class rapport and because it allowed the instructor to give immediate, detailed, individualized feedback. Id. at app. B at 234.
79. Id. at 202-03.
80. Id. Knaplund and Sander stress that, along with class size, linking instruction with contemporaneous doctrinal courses is a critical component for success and contrast their conclusion with the theories of academic support expert Paul Wangerin, who did not stress the doctrinal link in his suggestions for academic support programs. See id. at 205. Moreover, they emphasize that, contrary to suggestions from the Law School Admission Council, sensitive and interactive teaching is not enough to lead to a successful academic support program. See id. at 205-06.
81. Id. at 179-80.
82. Id. at 180 & n.57.
83. Id. at 180, 184 (describing how the assignments “tend to be more like problem-solving exercises than like full-fledged memos or briefs”).
84. Id. at 180.
85. Id. at 181.
gram, it had only a modest and temporary impact on student grades. Specifically, they found that participation in the summer program moderately improved students' first-semester grades, by an average of one point in their GPA. During the second semester, however, these gains were largely lost as students in the program lost ground relative to their classmates who were not in the program. The impact on the second and third years was inconclusive.

In comparing these results with those of the first-spring course, Knaplund and Sander observe that while both programs had moderate short-term effects, the effects of the summer program disappeared over time while the effects of the first-spring course grew. They contend that one of the important differences between the two courses is that the summer program "creates its own world of substantive law" because each day the students had a different lecturer who addressed different areas of law around a common subject matter, like topics related to family law and the relationship between spouses. Although the authors recognize that this variety gives students exposure to different teaching styles and aspects of the law school curriculum, they conclude that the approach is "too abstract" to have a lasting impact on grades. Moreover, in contrast to the first-spring course, the summer program instructors spent less time on explicit analysis of the learning process.

86. Id. The authors did note, however, that the program had a positive impact on retention in that students who participated in the program were less likely to drop out of school voluntarily. They also highlighted that, in qualitative surveys about the program, students were uniformly positive. See id. at 197-98; E-mail from Kristine S. Knaplund, Professor of Law, Pepperdine Univ. Sch. of Law, to author (May 11, 2007, 17:57 EST) (on file with author).
87. Knaplund & Sander, supra note 69, at 182.
88. Id.
89. Id. The authors stated that the coefficients for that timeframe were not statistically significant and thus the results were unclear as to whether the program did not affect students' GPA or did so by an increase of 0.51. Id. at 182 & n.63.
90. Id. at 182.
91. Id. at 183. In describing the broad doctrinal nature of the course, Knaplund and Sander report:
Students read early contracts cases which struck down premarital agreements as promoting divorce, and torts cases which eliminated California's doctrine of interspousal immunity. They also read two evidence cases which discuss application of a rule in a family law fact pattern, and a statute on marital property. At the same time, the students are exposed to a succession of skills: first how to read and brief a case, then how to read a series of cases, how to distinguish cases, and how to read a statute. The final class uses Marvin v. Marvin, 557 P.2d 106 (Cal. 1976), the California "palimony" decision, to discuss the role of policy.
Id. at 180 n.58.
92. Id. at 183.
93. Id. They added that such explicit instruction may be difficult before law school has begun because students do not have a set of examples they can employ to augment the class discussions. Id.
From these results, Knaplund and Sander reinforce their conclusion: "[A]cademic support is not effective in empowering students academically when its lessons are taught in isolation from courses to which students can immediately transfer and apply what they have learned." They add that instruction in learning methods should be explicit and that repeated practice in applying these methods, with feedback on these practice exercises, is important.

These authors' conclusions underscore the benefits of contextualization but highlight that problem solving transfer can be achieved through a stand-alone course if such instruction is done well. UCLA's first-spring course was in many ways a "detached" environment in that instructors taught the problem solving skills in a separate course that focused on skill development and covered skills relevant to several legal doctrinal contexts. In the most successful of the three iterations of that course, moreover, the instructor "spent[ted] as much time as possible explicitly explaining the learning process to students." That iteration of the course, however, was fundamentally "embedded" in that the instructor used concrete illustrations from material the students were covering at the time in their doctrinal classes and created incentives for the students to do well on practice questions by allowing them to opt-out of the follow-up class on the questions if they made above a certain score.

UCLA thus adopted an embedded instructional model that educational psychologists have later advocated in the design of successful problem solving programs. Specifically, problem solving expert Richard C. Mayer contends that problem solving instruction should include four basic features: (1) "Focus on a few well-defined skills"; (2) "Contextualize the skills within authentic tasks"; (3) "Personalize the skills through social interaction and language-based discussion of the process of problem solving"; and (4) "Accelerate the skills so that students learn them along with lower-level skills." Legal educators must consider each of these features as they seek to teach legal problem solving skills.

94. Id.
95. Id. at 207.
96. See id. at 178-79.
97. Id. at 179.
98. Id. at 177-78 (reasoning "teaching students the concept in a familiar (or even pressing) substantive setting decisively helps them to learn it").
99. See MAYER, supra note 38, at 454.
100. Id.
b. Pace Law School Program

In 2004 Leslie Yalof Garfield and Kelly Koenig Levi published a comprehensive study analyzing the effect of Pace University School of Law’s ASP on students who participated in the program between 1997 and 2001. The authors evaluated the effectiveness of three components of their ASP: “(1) the Individual Skills Development (‘ISD’); (2) the First Year Skills Workshop Series (‘Workshop Series’); and (3) the Dean’s Scholar Program.” In the ISD, students met one-on-one with an ASP instructor at the school. During these meetings, the instructor provided instruction to enhance the student’s study and preparation skills; and for students beyond the first semester, the instructor also assigned students practice essay questions to complete and then reviewed those questions with the students. In the Workshop Series, ASP professionals conducted workshops open to all first-year students during the first semester. These workshops addressed a series of skills including case reading and briefing, note-taking, course outlining, exam preparation, and exam-taking. The workshops were voluntary and were not for credit. In the Dean’s Scholar Program, upper-level students served as teaching assistants. These scholars conducted weekly study groups and held a weekly office hour for each of the first-year doctrinal courses. In their meetings, scholars sought to hone students’ substantive knowledge and analytical skills by focusing on course outlining and exam writing.

Garfield and Levi found that each of the three components led to statistically significant academic benefits to those students who participated. First, the students as a whole who participated in the ISD significantly improved their GPA during their semester of participation and the semester thereafter. Second, the students as a whole who participated in the Workshop Series had a significantly higher first-semester and cumulative GPA than non-participants. Third,

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102. Id. at 11.
103. Id. at 12-13. During the first semester, students met “regularly and sometimes less frequently”; during later semesters, students tended to meet weekly with the instructor. Id.
104. Id. at 13.
105. Id.
106. See id. at 13-14.
107. Id. at 20-23. The authors also discussed the effect of the ISD on student retention and first-time bar passage; the results showed a positive effect but were not statistically significant. Id. at 23-24.
108. Id. at 24-25. The authors also discussed how students participating in the Workshop Series had a 100% retention rate versus a 91.6% rate overall. Id. at 25. These results regarding the Workshop Series are suspect, however, because the comparison between participants and non-participants does not appear to be controlled for other predictors of law school academic success, like LSAT score. Id. at 24 n.87.
for three of the five years, students as a whole who participated in the Dean's Scholar Program outperformed non-participants with comparable LSAT scores. Overall, the authors found that students benefited the most from the ISD, followed by the Workshop Series, and then the Dean's Scholar program. The authors therefore concluded that students benefit the most from ASP services that provide the highest level of interaction with an ASP instructor.

Unlike Knaplund and Sander, Garfield and Levi did not discuss the extent to which ASP services need to be contextualized in order to promote academic success. Garfield and Levi did stress, however, that the various services in their program have an "emphasis on skills development." They add that the Dean's Scholars and ASP instructors did not "tutor" students in the doctrinal areas of law, and they noted that the doctrinal materials used in the Workshop Series included Criminal Law materials that were not part of the first-year Criminal Law curriculum. This programmatic emphasis on skills, however, does not detract from the fact that, as described in their study, Pace's services remained contextualized in doctrinal knowledge relevant to the students receiving the services. For instance, in the ISD and the Dean's Scholar program, the instructors taught students principles of outlining and how to answer hypothetical essay questions in the context of the material those students were actually covering in those classes. Thus, although the instructors were emphasizing skills and not doctrine, they were using examples and exercises that related directly to the students' relevant domain knowledge. In this way, the ISD and Dean's Scholar program related to the first-spring course offered at UCLA.

The contextualization of the Workshop Series was less direct because instructors in the series used examples that did not directly relate to what the students were studying in their Criminal Law course. It cannot be said, however, that the skills being taught were completely un-contextualized from the domain knowledge the students were developing. During the years the Workshop Series was

109. See id. at 27-28. The authors attributed the lack of positive effect in two of the five years to the fact that in those years "the administration of the program was not unified, and there was little coordination between the Dean's Scholar sessions and the academic support professional." Id. at 28. The authors also noted that the students who participated in this component had a higher retention rate than those with comparable LSAT scores who did not. Id. at 29-30. The program did not have an effect on first-time bar passage. See id. at 30.
110. Id. at 37.
111. Id.
112. Id. at 14.
113. Id. at 14-15.
114. See id. at 12-14.
115. See id. at 14-15.
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studied, Pace students received instruction in Criminal Law during their first year. Therefore, although the precise doctrinal concepts were not the same as those the students were studying in their Criminal Law course, they undeniably related to them. As noted above, the educational research demonstrates that cognitive transfer depends on the degree to which the transfer task and target task share cognitive and symbolic elements and analogical similarities and the degree to which instructors encourage students to reflect on how the knowledge might be transferred. The concepts in the workshops shared such elements with the concepts in the doctrinal classes, and the ASP instructors explicitly encouraged students to think about such transfer. The necessary contextualization therefore took place to promote transfer.

c. William Mitchell Program

In the most statistically robust study of a law school ASP, Cynthia Schmidt and Ann L. Iijima at William Mitchell School of Law began in 2003 an evaluation of the school’s ASP, called “Compass.” The school instituted the program in the fall of 2000, and the program targeted students considered at-risk because of certain indicators of their potential academic performance. To be admitted, these students

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116. During the time of the study, Pace did not have a stand-alone first-year course in Criminal Law; it combined instruction in Criminal Law with its first-year course in legal analysis and writing. See e-mail from Horace E. Anderson, Jr., Assoc. Dean for Academic Affairs, Pace University School of Law, to author (June 5, 2012, 11:42 EST) (on file with author). For a description of the combined course, see Detailed Course Information, Pace U., https://banners.pace.edu/prod/bwckctlg.p_disp_course_detail?cat_term_in=200920&subj_code_in=LAW&crse_num_in=622A (last visited June 5, 2012).

117. See SINGLEY & ANDERSON, supra note 53, at 3, 248; Gick & Holyoak, supra note 54, at 1.

118. Anderson et al., supra note 46, at 7.

119. It is noteworthy, however, that the positive effect of the Workshop Series was not as great as the ISD. See Garfield & Levi, supra note 15, at 37. One reason may be that the contextualization was not as keen in the Workshop Series as the ISD.

120. Schmidt & Iijima, supra note 66, at 657 & n.33. Applicants were selected for Compass based on their “admissions index.” Id. To determine an applicant’s index, the school first considered the applicant’s “predicted first year average” (“PFYA”) based on the algorithm the Law School Admission Council (“LSAC”) uses which gives specific weight to the applicant’s LSAT scores and undergraduate GPA. The school then used each applicant’s PFYA, together with other predictors of academic ability, for instance whether grades increased or decreased during the undergraduate years and the strength of the LSAT writing sample, to obtain the applicant’s “academic score.” The school also gave each applicant a “non-academic” score, considering factors such as motivation, extra-curricular activities, work experience, and whether the applicant overcame disadvantages. It combined the academic and non-academic scores to determine the applicant’s admissions index. Id. at 656 n.32. In 2007, the school changed the name of the Compass courses to Legal Reasoning Workshop I and II and amended other attributes of the program, such as the number students who are accepted to participate.
agreed to participate in Compass and dropped one of the doctrinal classes they normally would have taken during their first year. The program met weekly for one hour each week. Using material covered in Torts, "the students learn[ed] to read and brief cases, synthesize rules, develop outlines, and take essay exams. The students work[ed] both individually and in small groups, [and] complete[d] weekly written assignments." Compass professors graded these weekly assignments and provided one-on-one coaching two or three times to their students during the semester.

The authors evaluated the success of Compass by analyzing the first-year average GPA ("FYA") of the program participants. Twenty-eight students participated in the program in 2000, the year that was analyzed because it was able to be matched properly with a control group from students who matriculated in 1999. Data from twenty-two of these students was included in the study. The authors first found that thirteen of the twenty-two Compass students earned FYAs that were higher than their predicted FYA ("PFYA"). The authors next found that Compass students earned FYAs that were significantly higher than those in the control group; specifically, Compass students earned an average FYA of 2.41 whereas the control group earned an average FYA of 2.2. The authors were not able to assess the effectiveness of the program after the first year because of the methodological problems with comparing Compass and non-Compass students' GPAs after the first year and their academic probation and dismissal rates.

In reflecting on their results and offering suggestions for law school ASPs, Schmidt and Iijima argued that academic support programs "should focus on honing students' analytical skills rather than on tutoring them on legal doctrine." Moreover, they contended that such programs should work in conjunction with students' doctrinal

See e-mail from Sally Zusman, Dir. of the Academic Achievement Program, William Mitchell Coll. of Law, to author (June 6, 2012, 15:32 EST) (on file with author).
121. Id. at 657.
122. Id. at 657.
123. Id. at 660.
124. Id. at 658-59, 672.
125. See id. at 663, 668-69 (discussing why certain students were excluded and the issues involved in finding a proper control for the study). For instance, the authors excluded certain students because they had law degrees or law school credits from other countries. Id. at 666.
126. Id. at 669. Recall that the school computed PFYA based on the LSAC algorithm. See supra note 120 and accompanying text.
127. Id. at 669-70 & n.82. This difference was present even after factoring in the effect that PFYA has on FYA, which was necessary because the control group had higher PFYAs than the Compass students. See id. at 672.
128. See id. at 672 & n.88.
129. Id. at 675.
classes and should ground the “teaching of the skills in material the students are already covering” in their classes.\textsuperscript{130} In sum, these authors’ recommendations support Knaplund and Sander’s findings that stress a hybrid approach where problem solving skills are separately emphasized but are directly tied to a doctrinal course context that is relevant to the students’ other coursework at the time. They also follow the general recommendations of the educational and cognitive psychologists, which allow for a hybrid approach where concrete illustrations are enabled to be authentic because they are tied to specific domains in which the students are otherwise being instructed.\textsuperscript{131} Specifically, these illustrations are effective because they relate to tasks the students are expected to perform later in their doctrinal classes.\textsuperscript{132} Finally, these recommendations supplement the conclusions from Garfield and Levi in recommending that ASPs should emphasize skills development and not just focus on doctrinal review.

d. University of Richmond Program

In addition to these above studies of law school ASPs, Linda Jellum and Emmeline Paulette Reeves conducted a comprehensive study of the bar support program at the University of Richmond School of Law.\textsuperscript{133} Although their study focused on Richmond's services to help students pass the bar examination and not the school’s services to help them succeed in law school, the study nevertheless relates to the question of the importance of contextualization of learning. State bar examinations assess both doctrinal knowledge and skills like writing and analytical thinking.\textsuperscript{134} Therefore, the degree to which the teaching of those skills is contextualized would presumably relate to the success of the program. In fact, Richmond’s program is highly contextualized. The program not only covers essay-writing and test-taking skills that are relevant to the bar examination; it also offers classes that provide substantive review of certain bar subjects and individual

\textsuperscript{130} Id. at 675-76.
\textsuperscript{131} See, e.g., Mayer, supra note 38, at 425.
\textsuperscript{132} Id. at 408.
\textsuperscript{134} See Gantt, supra note 5, at 433-36 (surveying information from state boards of bar examiners which shows that bar examinations test such skills as whether applicants can discern which facts are relevant and whether they can write an answer that is well-reasoned and logically organized).
“tutoring” in which the instructor “teach[es] substantive rules of law.”135

Based on data from students taking the July 2001 to July 2004 bar examinations, the authors concluded that the bar support program resulted in a statistically significant improvement in the first-time bar passage rates of Richmond's graduates.136 They further found that the program had the greatest effect on those students graduating in the bottom half of their class.137 Given the program's intentional mixture of doctrinal tutoring and skill development, it is impossible to isolate whether the improvement was linked more to one factor or the other.138 The combination of the two, however, certainly led to robust results, thus supporting the general proposition that skill development is most enhanced when taught in a contextualized manner.

e. Results from Other Schools

Given the difficulty of conducting statistically robust studies,139 other law schools have conducted less comprehensive studies, but

135. Jellum & Reeves, supra note 133, at 661-63. The program also teaches time management skills. Id. at 682.
136. Id. at 671-72. The authors specifically compared the test-takers during that period with the test-takers who sat for the exam at some point from July 1997 through February 2001. In comparing these two groups, the authors found that the passage rate increased 6.2 percentage points or 8.5%. Id. at 669, 672. The authors conducted statistical analyses to rule out that the increase was the result of (1) increased selectivity in admissions criteria; (2) increased academic performance of students overall during the test period; or (3) decrease in the difficulty of the bar exam. Id. at 673-77.
137. See id. at 671. This comparison did not control for any motivational differences that may have been present between the participants and non-participants because instituting such controls would have randomly excluded some students from participating. See e-mail from Emmeline Paulette Reeves, Assoc. Professor for Academic Success, Univ. of Richmond Sch. of Law, to author (May 15, 2007, 13:24 EST) (on file with author). The authors found that the participation in the program did not statistically improve the first-time passage rate of those who were in the top half of their graduating class. See Jellum & Reeves, supra note 133, at 679-80. These results contrast with the results from the Pace study, which found that students at all different class ranks benefited equally from ASP participation. See Garfield & Levi, supra note 15, at 36. This difference may be due, in part, to the fact that, as Jellum and Reeves suggest, many of the students in the top half of Richmond's class would have passed the bar exam in any event. See Jellum & Reeves, supra note 133, at 679. These students thus have essentially no room for improvement in terms of passage rate. In contrast, even students in the top half of the class could improve their GPAs; those students are not all near or at a 4.0.
138. In fact, neither factor may have been as important as the emotional benefit students who participated in the program received. Jellum and Reeves discussed how students in the program receive tips on stress management and other issues in order to build the students' confidence. Id. at 665.
139. See Schmidt & Iijima, supra note 66, at 654-55. For instance, Adam Todd wrote a comprehensive article discussing the changes to the ASP at Northern Kentucky University's Salmon P. Chase College of Law. He reported that after implementing the
these studies similarly point to the benefits of integrating problem solving instruction into a doctrinal course context. For instance, Michael Hunter Schwartz conducted a study at Western State College of Law in which he compared two types of ASP instruction. One section of students received academic support instruction that was integrated into several of their doctrinal courses, and one section received the law school's regular academic support instruction. Schwartz found that the students who received the integrated academic support attained first-year GPAs that were twenty percent higher than their colleagues in the other section. In another study at St. Thomas University School of Law, Rory Bahadur analyzed the impact of the school's "active learning methodologies," similar to the problem solving instructional techniques described above, on first-time bar passage. Prior to the commencement of the program, the school's first-time passage rate on the Florida bar exam was fifty-two percent and thirty-three percent the last time and next to the last time it had been given. The first group of students to be introduced to this academic support methodology attained a first-time passage rate of seventy-four percent. Bahadur reported that no other "identifiable or tangible institutional changes" occurred for the recent group except for the changes in the new academic support model. Finally, other law schools report success with their academic support program efforts that have been integrated within a doctrinal course context. The changes, the school's bar passage rate "improved dramatically." Adam G. Todd, Academic Support Programs: Effective Support Through a Systemic Approach, 38 Gonz. L. Rev. 187, 189 (2003). The relationship between the ASP and the rate increase, however, cannot be determined because the school also instituted other changes at the same time, including tightening its academic probation and dismissal policy and increasing the number of required courses. Id. at 212.

140. E-mail from Michael Hunter Schwartz, Assoc. Dean for Faculty & Academic Dev., Washburn Univ. Sch. of Law, to author (Apr. 20, 2007, 18:06 EST) (on file with author).

141. Id. To control for bias, the same Criminal Law professor taught both sections and graded the essays blindly and the same Civil Procedure multiple-choice final was given to both sections. Id. Also, the other professors for the two sections were carefully selected to control for bias. See e-mail from Michael Hunter Schwartz, Assoc. Dean for Faculty & Academic Dev., Washburn Univ. Sch. of Law, to Herbert N. Ramy, Dir. & Professor of Academic Support, Suffolk University Law School (Apr. 25, 2007, 11:44 EST) (on file with author).

142. Posting of Rory Bahadur, RBahadur@STU.edu, to asp-l@chicagokent.kentlaw.edu (Apr. 16, 2007, 11:37 EST) (on file with author).

143. Id.

144. Id.

145. Id.

146. For instance, Regent's Summer Academic Success Program and Academic Orientation adopted a new integrated approach in 2002. See supra note 34 and accompanying text. Student feedback in the program evaluations over this ten-year period has been overwhelmingly positive. In fact, these programs have become increasingly integrated over the years, as discussion of the doctrinal material in the skills component
benefit of these efforts has led new schools to consider adopting ASP components that are tied expressly to doctrinal courses the students are taking at the time.\textsuperscript{147}

3. General Curricular Recommendations

The above discussion highlights how educational programs that tie instruction in domain knowledge with instruction in problem solving skills are the most successful in promoting meaningful learning. In the law school context, the ASP studies discussed above provide the most comprehensive evidence supporting this benefit, but anecdotal evidence from non-ASP doctrinal classes similarly support the benefits of tying problem solving instruction into doctrinal coursework.\textsuperscript{148}

Even when such connection is present in instructional design, however, legal instructors must ensure that they explicitly discuss with their students how to make those connections between analytical...
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skills and doctrinal understanding. For instance, in considering this issue of learning transfer, legal scholar Susan Bennett has contended that in legal education "transferability depends on the care which the teacher takes in making the learning lessons explicit across the boundaries of discrete experiences."\textsuperscript{149}

Legal educators thus must consider the extent to which they make these connections explicit. Emphasizing such connections does not mean that instructors must create a passive learning environment in which the students are not challenged in the classroom. Rather, instructors must take care not to assume that students necessarily see those connections; students often fail to see the forest for the trees.\textsuperscript{150} Law school teachers need to create a rich, active learning environment for their students, who may disengage either because the instructor is merely transmitting information to them or because the instructor is leaving such holes in the instruction that the students are lost in making the connections. Instructors can bridge this gap by discussing with their students explicit step-by-step problem-solving or decision-making frameworks and then challenging the students to develop and apply these frameworks.

Recent works on law school teaching have emphasized instruction in problem solving and have identified specific practices to help educators make their teaching properly contextualized.\textsuperscript{151} Legal instructors will undoubtedly vary their techniques as they search for techniques that complement their personal styles, but research discussed above overwhelmingly encourages legal educators to pursue that search. Contextualization is key, and law schools must continue to find new ways to coordinate the discussion of doctrinal knowledge with the discussion of procedural knowledge as it relates to the formation of problem solving skills.

III. THE ROLE OF DOMAIN KNOWLEDGE

In addition to the issue of the contextualization of problem solving, legal educators must confront a question of sequence. That is, although the above discussion highlights that students must receive

\textsuperscript{149} Bennett, supra note 40, at 65.
\textsuperscript{150} See Gantt, supra note 147, at 13-15.
\textsuperscript{151} See STUCKEY ET AL., supra note 2, at 141-57 (including a section on methods for employing "context-based" education); LEARNING CURVE (Ass'n of Am. Law Sch. Section on Academic Support), Fall 2009, available at http://www.aals.org/documents/sections/academicsupport/LearningCurve200912Fall.pdf (presenting thematic issue including several articles discussing models for integrating academic support instruction, including problem solving instruction, into doctrinal course contexts); see also Tonya Kowalski, True North: Navigating for the Transfer of Learning in Legal Education, 34 SEATTLE U. L. REV. 51 (2010) (discussing an approach legal educators can use throughout the curriculum to enhance students' transfer of learning).
instruction both in doctrine and in problem solving, legal educators must consider the extent to which students need a foundation in that doctrinal subject matter, or domain knowledge, before they are explicitly instructed in problem solving skills. This section first analyzes studies in educational and cognitive psychology that have considered the relationship between domain knowledge and the development of expertise. The section then considers the implications of these studies on pedagogy in the law school context.

A. EXPERTISE AND DOMAIN KNOWLEDGE

Domain knowledge is the firm foundation for doctrinal knowledge. Domain knowledge is specifically defined as the “explicit knowledge of the concepts, principles, and structures of thinking about the particular domain in which the problem arises.” This type of knowledge is contrasted with “procedural” knowledge, which is knowledge “about how to do things.” This distinction between domain and procedural knowledge has been described as the distinction between “knowing that” and “knowing how.” Procedural knowledge often is acquired through experience and becomes “tacit” knowledge when the knower cannot fully express this knowledge verbally. In cognitive science studies, 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.

153. See supra note 36 and accompanying text.
154. Krieger, supra note 36, at 153 (citing 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 & Joseph A. Horvath eds., 1999)). Educational and cognitive psychologists also refer to this type of knowledge as “declarative knowledge.” See Schraw, supra note 30, at 247 (defining declarative knowledge as “a broad category that includes facts, concepts, and the relationships between concepts that lead to an integrated understanding of a domain of knowledge”).
155. Schraw, supra note 30, at 248; see also Dennis J. Devine & Steve W.J. Kozlowski, Domain-Specific Knowledge and Task Characteristics in Decision Making, 64 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 294, 294 (1995) (distinguishing between “declarative” and “procedural” knowledge).
156. Patel, Arocha & Kaufman, supra note 154, at 78.
and experts solve hypothetical problems, and how individuals with different levels of expertise perform in practical settings.

This research concludes that a person must adequately understand the domain knowledge in an area to be an expert or creative problem solver in that area. Having this well-integrated domain knowledge is necessary to effective problem solving of both "well-structured" problems (like geometric proofs) and "ill-structured" problems (like most legal problems, which possess multiple solutions). Scholars reason that experts who have a good grasp of the subject matter exhibit a "baseline tolerance for ambiguity" as well as a "willingness to confront irregularities" and a "learned instinct for finding 'complementarity' or congruence among seemingly isolated facts." In applying this research to the law school context, Stefan Krieger contends that "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."


161. See Krieger, supra note 36, at 165-66; Patel, Arocha & Kaufman, supra note 154, at 76 ("[W]e argue for the importance of domain knowledge in the acquisition of medical expertise."); Robert W. Weisberg, Problem Solving & Creativity, in The Nature of Creativity: Contemporary Psychological Perspectives 155 (Robert J. Sternberg ed., 1988) ("[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."); Wiley, supra note 152, at 716 ("The possession of a large body of domain knowledge is central to expertise.").


164. Krieger, supra note 36, at 166.
Finding that domain knowledge is important to problem solving does not explain how such knowledge enhances problem solving. To that end, cognitive psychological research has also analyzed how experts employ the domain knowledge in problem solving. Such studies have underscored that simply increasing an individual's domain knowledge does not result in a perfectly correlated enhancement in his or her problem solving. Problem solving is not solely determined by the amount of one's knowledge. Expert problem solving is neither simply applying powerful search algorithms to an extensive knowledge base nor merely accessing patterns of recognition drawn from domain knowledge and past experience. In sum, researchers in this area 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.”

Educational and cognitive psychologists recognize generally that all individuals organize domain knowledge based on “schema.” Expert problem solvers, however, have well-developed schemata, which they internalize and then access according to particular problems. Researchers conclude that these schemata organize experts' knowledge so they can quickly and efficiently access their memory and find potential solutions to problems. According to studies on expertise,

165. See Devine & Kozlowski, supra note 155, at 295.
168. Educational psychologist Gregory Schraw calls schema “one of the most important organizational units of memory” and defines the term as “an organized body of information about some distinct domain of knowledge.” Schraw, supra note 30, at 248.
170. See Hershey et al., supra note 159, at 80; Lustbader, supra note 169, at 326-27; Wiley, supra note 152, at 716-17. Experts' use of schemata has a downside, however. Specifically, experts are vulnerable to “fixation effects,” in which they commit decision-making error when they simplify a problem by problematically fitting new variables into their existing schema. See Krieger, supra note 36, at 175-76 (quoting Frensch & Sternberg, supra note 166, at 176). Similarly, experts' use of schemata also can hinder their ability to remember all the information about a problem. Because they immediately discern relevant versus irrelevant information, they are less likely than intermediates (those between novices and experts) to recall the exact information in a problem. Krieger, supra note 36, at 175-76 (citing Wiley, supra note 152, at 716-17).
experts confronting a new problem devote a substantial amount of time analyzing the structure of the problem in order to match the problem with known "scripts."\textsuperscript{171} Scripts are "extended action sequences" or "solution paths," which individuals use to solve problems.\textsuperscript{172} Everyone has thousands of scripts; the difference is that expert problem solvers have well-developed scripts that help them solve complex problems in their domain of expertise.\textsuperscript{173}

In solving problems, experts’ use of domain knowledge is critical. First, they use the knowledge to help them disregard irrelevant information in the problem and guide their search for additional relevant information.\textsuperscript{174} Second, although they develop schemata from both their domain knowledge and past experience, the domain knowledge provides an important organizing framework for that development.\textsuperscript{175}

For instance, increased domain knowledge gives the problem solvers important contextual information that enhances problem solving.\textsuperscript{176}

\textsuperscript{171} See, e.g., Frensch & Sternberg, supra note 166, at 161. Cognitive psychologists also theorize expert problem-solving is incremental in that experts first recognize similarities between a given problem and their stored knowledge about past situations and then, when a proposed solution is determined to be insufficient, recast the problem, seek to retrieve additional information, and attempt to find other solutions. See, e.g., Arthur J. Cropley, Creativity and Cognition: Producing Effective Novelty, 21 ROEPER REV. 253, 258 (1999); Patel & Groen, supra note 166, at 93; Weisberg, supra note 161, at 152.

\textsuperscript{172} Frensch & Sternberg, supra note 166, at 161; Schraw, supra note 30, at 249.

\textsuperscript{173} See Schraw, supra note 30, at 249-50 (discussing how scripts, for instance, enable doctors to perform complicated operations).

\textsuperscript{174} Krieger, supra note 36, at 168 & n.82 (citing Vimla Patel et al., Reasoning and Instruction in Medical Curricula, 10 COGNITION & INSTRUCTION 335 (1993)) (highlighting parenthetically a study of medical students that found that intermediate students used more information to solve a problem than experts because the experts seemingly were able to filter out irrelevant information whereas the “use of irrelevant information by intermediates appear[ed] to be a sign that knowledge is becoming reorganized”).

\textsuperscript{175} See Krieger, supra note 36, at 169 (citing, Patel et al., supra note 169, at 335) (“Domain knowledge provides the mechanization for understanding and identifying problem structure”). Cognitive psychologists add that domain knowledge becomes “tacit” knowledge as the problem solver develops the scripts and schemata for handling different types of problems. Patel, Arocha & Kaufman, supra note 154, at 76-77.

\textsuperscript{176} Krieger, supra note 36, at 170 (citing Devine & Kozlowski, supra note 155, at 296). One study in the legal field supports this reasoning. Specifically, the study found that experienced lawyers solved legal problems more ably than law students even when both groups were provided with the same legal materials and fact problem. See Ian Weinstein, Lawyering in the State of Nature: Instinct and Automaticity in Legal Problem Solving, 23 VT. L. REV. 1, 37-38 (1998). Scholars concluded that this difference was because the experienced lawyers had more informed contextual knowledge that gave them a larger context for interpreting the law and facts in the particular problem. Krieger, supra note 36, at 171; Weinstein, supra, at 37-38. This research supports the general proposition that effective learners first seek to understand the context of a problem before focusing on its details. See Ruth Ann McKinney, Reading Like a Lawyer: Time Saving Strategies for Reading Law Like an Expert 105 (2005).
Such knowledge also facilitates collaborative problem solving by giving solvers a language they can use to communicate with their colleagues. Furthermore, such knowledge promotes creative problem solving because it gives expert solvers the framework needed both to consider new ideas and still to move towards the solution.

In terms of the decision-making process itself, sophisticated schemata enable experts to engage in "forward reasoning," in which a problem solver "draw[s] inferences from available data . . . and sequentially mov[es] toward the solution of a problem without having to explicitly test and evaluate hypotheses." For instance, studies show that, unlike medical residents, senior physicians interviewing a patient use their schemata to filter out irrelevant information and reach a potential diagnosis relatively quickly and then seek more information to confirm that diagnosis. This decision-making process contrasts with "backward reasoning," which is more often used by novices and occurs when 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." Cognitive research has shown that forward reasoning is more highly correlated with accurate problem solving than is backward reasoning. This higher correlation likely stems from the fact that backward reasoning is slower and puts heavier demands on the solver’s working memory.


178. Krieger, supra note 36, at 173-75 (citing MIHALY CSIKSZENTMIHALYI, CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION 90 (1996)) ("You cannot transform a domain unless you first thoroughly understand how it works."). This notion is a more sophisticated version of the adage I use with my students: “You can’t run before you can walk.”

179. Patel, Arocha & Kaufman, supra note 154, at 82. When experts face novel or particularly difficult problems, however, they may not be able to rely on existing schemata. They therefore must engage in backward reasoning and will use their domain knowledge as “reference points” as they test hypotheses. Krieger, supra note 36, at 172-73 (citing, inter alia, Vimla Patel & David R. Kaufman, Clinical Reasoning & Biomedical Knowledge: Implications for Teaching, in CLINICAL REASONING IN THE HEALTH PROFESSIONS 121 (Joy Higgs & Mark Jones eds., 1995)).


182. See Krieger, supra note 36, at 169-70 (discussing study involving problem solvers in the medical field).

183. See Patel & Groen, supra note 166, at 94.
In sum, studies from cognitive psychology show that domain-specific knowledge enhances problem solving by: (1) enabling individuals to develop powerful schemata and scripts that help them solve problems; (2) leading individuals to engage in efficient forms of forward reasoning that expedite the problem solving process; and (3) providing individuals with language structures that promote collaborative problem solving and creative solutions.  

B. Pedagogical Implications

1. Medical School Research on Instructional Sequence

In light of these aspects of expert problem solving and the role of domain knowledge in such development, legal instructors must ask how they can best integrate domain knowledge and procedural knowledge in the law school classroom. Section II of this Article stresses the idea that the two must be integrated. Insightful research on how they should be integrated has been conducted in the field of medical education.

That research, conducted by Vimla Patel and her colleagues at McGill University's Centre for Medical Education, compared the reasoning processes and diagnostic accuracy of medical students and graduates from two different medical schools. The two institutions studied employed different pedagogical approaches. One school used a conventional curriculum, in which students spent one and one-half years learning basic science before they were exposed to problem solving in the clinical context. The students learned this material in separate disciplined based courses. Instructors used illustrative clinical problems in these courses, but the primary mode of instruction was the traditional lecture method.

The other school utilized a “problem-based learning” curriculum, in which students learned basic science in the context of clinical problems. In this program, students were introduced to patients during their first term and were “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.” Students addressed the scientific principles and the clinical concepts in a setting

184. See Krieger, supra note 36, at 177.
185. See supra notes 38-151 and accompanying text.
186. Krieger, supra note 36, at 178 (surveying the Patel research); see also Patel et al., supra note 169, at 331.
that did not clearly differentiate between the two. Moreover, this institution focused on small-group and self-directed learning methods as opposed to the lecture and supervised teaching formats at the conventional institution.

In their research, Patel and her colleagues found that students and graduates educated in the conventional curriculum evidenced a greater tendency to employ forward reasoning in their problem solving and to provide higher quality explanations for their diagnoses than those educated in the problem-based curriculum. The conventionally educated students also mastered the basic scientific principles better than their counterparts. The researchers hypothesized that the conventional curriculum was more successful in these regards because it provided its students with a well-organized knowledge base through which to organize their clinical problems. These students, in contrast to those in the problem-based curriculum, acquired the needed expert scripts and therefore could engage in effective forward reasoning. Patel and her colleagues further reasoned that the problem-based curriculum was less effective because it conflated the different reasoning skills that are involved in understanding scientific processes and making clinical diagnoses.

Patel and her colleagues did observe that the conventionally educated students evidenced the downside of forward reasoning that occurs when scripts hinder the problem solvers' ability to see and correct errors in their thought process. In such cases, they prematurely stop their reasoning process and fail to consider alternative hypotheses. Students educated in a problem solving context were better able to amend their hypotheses and learn from experience to correct their mistakes. The researchers therefore opine that conventionally educated students should be better educated by increasing their instruc-

188. See Patel et al., supra note 169, at 341.
192. Patel et al., supra note 169, at 342.
193. Id.
194. See Patel et al., supra note 174, at 375 ("[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.").
195. See Krieger, supra note 36, at 183-84.
196. See Patel et al., supra note 169, at 352.
tion in explicit techniques they can use in diagnostic problem solving. An additional insight the researchers gleaned from their studies relates to the principle in cognitive psychology of cognitive load. Cognitive psychologists have learned that the amount of information the nervous system can process at any one time is limited. Cognitive load theory considers these limits and addresses how different cognitive resources are utilized during the learning process. In particular, the theory advances that some instructional methods place too many cognitive demands on students and therefore actually impede learning.

Patel and her researchers drew upon such theory to posit that the medical students taught under problem-based instruction experienced cognitive load and therefore were not able to grasp the scientific knowledge base as well as the students taught under the conventional curriculum. In reaching this conclusion, they pointed to other research showing that some instruction methods that focus on teaching problem solving skills problematically divert attention from other important aspects of the problem that are essential to learning. This conclusion emphasizes the principle, noted above, that problem solving knowledge and knowledge of core scientific concepts involve two different modes of cognition. Students who therefore are expected to learn both knowledge structures at the same time may have their attentive resources strained to the point that they may not be able to master either well. This conclusion also reflects the reasoning, noted above, of cognitive and educational psychologists who remain

200. Burgess, supra note 199, at 40. The principle of cognitive load appears more and more relevant as modern society exposes individuals generally to more and more information. See World’s Data More Than Doubling Every Two Years—Driving Big Data Opportunity, New IT Roles, EMC CORP. (June 28, 2011), http://www.emc.com/about/news/press/2011/20110628-01.htm [hereinafter World’s Data] (discussing a June 2011 study sponsored by EMC and conducted by the research firm, IDC, which found that the world’s digital information “is more than doubling every two years—with a colossal 1.8 zettabytes to be created and replicated in 2011”).
201. Patel et al., supra note 169, at 342.
203. See supra notes 154-57 and accompanying text.
204. Patel et al., Conceptual Change, supra note 169, at 335.
concerned that embedded problem solving instruction may "disrupt processing" of doctrinal material.\textsuperscript{205}

2. Implications for Legal Instruction

a. Content of Domain Knowledge

Stefan Krieger, Professor at Hofstra University School of Law, has drawn upon this medical school research to consider how legal instruction can best teach students. Krieger first opines that this research supports the notion that legal instruction must include a doctrinal base to educate its students properly. Beginning with instruction in problem solving skills is not enough: "A person must learn how to think inside the box before venturing to think outside of it."\textsuperscript{206}

Krieger's position makes sense. Indeed, in engaging in legal problem solving, individuals must early in the process engage in a sophisticated process of determining relevance.\textsuperscript{207} Some scholars who have analyzed relevance have started from the position that the lawyer knows the legal rules at issue and thus is focused on discerning relevant facts based on those rules.\textsuperscript{208} Lawyers who have such a domain knowledge base are more likely to have well-developed schemata they can employ in assessing relevance and solving legal problems.\textsuperscript{209} Legal educators should therefore engage in problem solving applications only after they have adequately introduced the domain knowledge at issue to students. This position relates particularly to orientation and academic support programs ("ASPs") and to detached skills-based courses, like the first-year legal writing course. Based on the psychological research, instructors in these areas should consider crafting assignments that are tied to students' doctrinal courses so that students are likely to have the domain knowledge needed in order for them to get the most out of the explicit problem solving instruction. Specifically regarding orientation programs, instructors should provide instruction in the relevant legal doctrine—even if only very brief—before they address problem solving skills, like exam-taking, tied to that area.\textsuperscript{210}

\textsuperscript{205} Derry & Murphy, supra note 41, at 31; see also supra note 44 and accompanying text.

\textsuperscript{206} Krieger, supra note 36, at 186; see also Stuckey et al., supra note 2, at 74 (quoting Krieger to affirm the position that law students must have sufficient knowledge of legal doctrine before they can begin legal problem solving).

\textsuperscript{207} Gantt, supra note 5, at 445-48.

\textsuperscript{208} See, e.g., Steven J. Burton, An Introduction to Law and Legal Reasoning 98 (3d ed. 2007).

\textsuperscript{209} Krieger, supra note 36, at 189.

\textsuperscript{210} For instance, during Regent's orientation program, students have two classes in Property law, taught by one of the Property professors, before they are asked to out-
Moreover, based on the research noted above, such a knowledge base helps decision-makers in other ways. First, it creates a common language they can use to discuss the problem with both colleagues and adversaries. Because legal language necessitates precision, legal decision-makers need a refined knowledge base to ensure they are speaking the same language. Second, this knowledge base helps decision-makers facing novel situations develop new research strategies or revise their arguments so as to narrow or expand the law. In contrast, lawyers who do not know the relevant rules that apply to a situation must employ heuristics or other problem solving techniques that, while helpful for efficiency's sake, may lead to problematic decision-making errors.

Legal educators thus must be intentional about instructing students in the “language of the law” as it relates to the doctrinal material at issue so that the students can develop the mental schemata that facilitate their discourse with others. Orientation programs similarly should expose students at least to foundational legal terms and highlight the need for students to take seriously the importance of understanding the precise meaning of the legal terms they encounter.

Given that domain knowledge is critical to expert problem solving, the question arises what domain knowledge is essential to legal problem solving. The question cannot be answered absolutely for all
legal contexts because law is becoming increasingly complex and the combinations of caselaw, statutes, regulations, and the like that may be implicated by legal problems are as numerous as the number of problems themselves. Despite this limitation, certain tenets of domain knowledge may be so broadly applicable that they could be considered as essential domain knowledge for all new lawyers. Indeed, in his comprehensive work on domain knowledge in the legal context, Krieger reasons that “principles of legal reasoning” are properly considered basic domain knowledge for lawyers.215

In an earlier article, I identified key cognitive components of what it means to think like a lawyer.216 Although the article did not frame these components in terms of principles of domain knowledge, the components can be recast in such a way. Those components might then be supplemented with additional, foundational principles.217 In this vein, Best Practices for Legal Education discusses foundational principles of knowledge that all law school graduates should possess.218 These principles include domain knowledge principles like “the law of contract and tort and of parties’ obligations, rights, and remedies.”219

The work, however, also includes other concepts that relate to principles that would not traditionally be seen as legal domain knowledge.220 Indeed, recent literature on legal problem solving would add that the basic domain knowledge needed for effective lawyering includes more than legal doctrine and legal reasoning principles.221 In general, these scholars contend that legal education concentrates too heavily on rule-based problem solving in the adversarial context and therefore overlooks the “emotional and relational components of the lawyering process” and overall stifles creative problem solving, ignoring the “human context of legal cases.”222 For instance, one theorist

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215. Krieger, supra note 36, at 155. Although Krieger makes this observation, he does not attempt defining what specific principles are key because such an inquiry was beyond the scope of his article.

216. See generally Gantt, supra note 5, at 436-78; see also supra note 29 and accompanying text.

217. Identifying all the types of domain knowledge that are foundational to legal thinking was beyond the scope of the previous article because that article focused on particular cognitive processes in legal thinking and not on legal reasoning principles per se.

218. Stuckey et al., supra note 2, at 65-91.

219. Id. at 73 (discussing other core doctrinal principles related to “knowledge” and “understanding” of the law).

220. See id. at 72 (reasoning that graduates should demonstrate self-efficacy).

221. See Morton, supra note 27, at 384. “My short-term goal in teaching a creative problem solving component in my classes is to engage the students in thinking processes in addition to that of legal analysis . . . .” Id. (emphasis added).

222. Krieger, supra note 36, at 158-62 (surveying research on legal problem solving). Thomas D. Barton has considered this issue extensively and has written that “[t]he
contends that basic skills essential to effective lawyering include "relational reasoning." The necessity of such skills is debatable, but recent efforts to define the extent of domain knowledge all law school graduates should have is critical in light of the importance of having the right knowledge base as a precursor to mastering problem solving. Therefore, if law schools desire to graduate students with skills in "practical judgment" and "relational reasoning," they must ensure they are educating students with the domain knowledge needed to acquire those skills.

b. Brainstorming

Many legal educators recommend that teaching legal problem solving should involve the use of brainstorming and similar techniques in order to foster students' creativity as they solve problems. Specifically, these educators encourage students to resist the impulse to prejudge how to solve the problem based on the first thought that comes to them. Instead, they recommend that students suspend judgment when they face a problem and develop alternative hypotheses through "reverse thinking, random stimulation, developing original analogies, and brainstorming."
Based on the cognitive psychology research discussed above, Stefan Krieger opines that such recommendations are questionable. He writes:

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. 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.\(^2\)

From this position, Krieger reasons that law schools should spend less time encouraging students to brainstorm all the possible hypotheses when they face a problem and more time instructing students on how to analyze problems such that their “first thoughts” about a problem prove to be accurate assessments of that problem.\(^2\) He adds that the cognitive psychology studies show that students are more likely to develop accurate “first thoughts” through instruction in relevant doctrinal knowledge than in problem solving methods and that inadequate doctrinal instruction paired with problem solving instruction may actually impede skills acquisition due to excessive cognitive load.\(^2\)

Research on law school academic support programs supports Krieger’s recommendation. In considering the benefits of ASP summer programs, Knaplund and Sander reason that even if summer programs try to anticipate doctrines to be discussed during the first year, “it seems unlikely that students can simultaneously acclimate themselves to the case method, learn substantive law, and diagnose any weaknesses in their own approach that prevent them from learning as much as they can.”\(^2\)

These remarks reflect the principle of cognitive


\(^{229}\) Id. at 192 (“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.”).

\(^{230}\) Id. at 192 (“Understanding the problem may be more important than developing alternative hypotheses for solving it.”).

\(^{231}\) Knaplund & Sander, *supra* note 69, at 178, 206 (adding that “the secret, it seems, is to have students really understand a learning concept before asking them to transfer it to other subjects; and teaching students the concept in a familiar (or even pressing) substantive setting decisively helps them to learn it”).
load. Krieger, Knaplund, and Sander, however, overlook the fact that cognitive load can be avoided by limiting the skills in focus. Therefore, if legal instructors are not able to provide students with a sufficient foundation in domain knowledge in order to instruct students in multiple skills, they should focus on a few well-defined skills in their problem solving instruction.

c. Script Development

The above discussion highlights how legal education should concentrate on script development as a framework for any brainstorming necessary in creative problem solving. Research in the medical context provides insight into teaching script development. From their research, Patel and her associates contend that instructors seeking to help students develop such scripts “need[] to be able to articulate knowledge . . . that would normally be tacit for a practitioner not engaged in instruction.” They recommend that instructors need to help demystify expert reasoning by making each step in that reasoning process explicit. Similarly, instructors need to teach students how to articulate the explicit steps in their reasoning process so that the students can craft problem solving scripts.

From this research, Krieger opines that legal instructors need to help students use their domain knowledge to structure problem solving frameworks. He specifically suggests that law school skills training courses should focus on problem solving in areas, such as first-year foundational subjects, in which students have knowledge of both the relevant substantive and procedural rules. He adds that

232. See supra notes 198-205 and accompanying text.
233. See Mayer, supra note 38, at 425.
234. See id.
235. Patel et al., supra note 154, at 89.
236. Id.
237. Id. (contending that “[e]xperienced physicians have evolved specific heuristics that can be conveyed to medical trainees through effective clinical teaching”).
238. Krieger, supra note 36, at 200. Krieger reasons, “Legal rules and doctrine are not just a ‘tool’ in the lawyer’s toolbox; they provide the overall framework for the compartments in the box.” Id. (footnote omitted) (citing Kerper, supra note 26, at 355).
239. Id. at 201. Krieger adds that such script development would be hindered in areas of law that involve complex statutory or administrative structures or multiple structures or forums. Id. The UCLA School of Law provides an example of a course that teaches problem solving after the students are thoroughly educated in the doctrinal course context. Course Description: Law 446: Clinical: Venture Capital Formation and Financing, U. CAL. L.A. SCH. L., http://www.law.ucla.edu/academic-programs-and-courses/curriculum/course-descriptions/Pages/law-446-clinical-venture-capital-formation-and-financing.aspx (last visited Aug. 12, 2011) (describing simulation course in which students gain “the analytical tools needed for evaluating the form of entity appropriate for the start-up company” after completing courses in Federal Income Taxation and Business Associations).
students' need for a knowledge base may not be alleviated simply by “giving the students the applicable law,” either by providing them with the relevant sections of the law or by teaching students the relevant law in an intensive lecture that does not allow students time to reflect on the information being presented.\textsuperscript{240} Indeed, evidence from law school courses related to problem solving supports the position that students need more than brief instruction or a brief review of material in order to engage in complex problem solving on that material.\textsuperscript{241}

Krieger also reasons that students' inadequate knowledge base can stifle their creative problem solving because they experience increased anxiety and an absence of the psychological “flow experience” that occurs when individuals feel they have the skills needed to complete the task before them.\textsuperscript{242} Studies have shown that many law students already undergo psychological distress that impedes their academic success in law school and that this distress begins in their first year.\textsuperscript{243} Instructors thus can work to alleviate some of this anxi-

\textsuperscript{240} Krieger, supra note 36, at 202. Krieger reasons:
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.

\textsuperscript{241} From 2001 to 2006, Regent colleagues and I taught to graduating students a course titled “Advanced Legal Reasoning, Analysis & Writing.” In the course, my co-instructors and I presented students with a written summary of the law in a discrete area and then assigned them a hypothetical essay question based on that law. See L.O. Natt Gantt, II, Regent Offers Course on Advanced Legal Reasoning, \textit{Learning Curve} (Ass'n of Am. Law Sch. Section on Academic Support), Spring 2002, at 3, available at http://www.law.umkc.edu/faculty/profiles/glesnerfines/asp/Learningcurvespring2002.pdf. The course was designed to hone students' analytical and writing skills, but instructors sometimes found that, although the summary contained all the law needed to answer the question, students had difficulty answering the question because they had not grasped the relevant law from the summary. The issue for these students was therefore not necessarily inadequate procedural knowledge in problem solving but inadequate doctrinal knowledge in the area of law at issue.

\textsuperscript{242} Krieger, supra note 36, at 203-04 (citing Csikszentmihalyi, supra note 198, at 49, 97).

ety as related to knowledge acquisition by focusing on instruction in domain knowledge as a way to foster a conducive problem solving environment. Instructors leading first-year orientation programs and first-semester courses particularly might consider spending more time providing students with a domain context before asking them to engage in problem solving on the material at issue.

Despite this importance of students’ script development, teaching such development is not as easy as might be imagined. Research has shown that instructors sometimes suffer from the “expert blind spot effect,” in which experts view solving problems from their perspective rather than from the perspective of the novice students. This effect may lead educators with expertise in the subject matter “to use the powerful organizing principles, formalisms, and methods of analysis that serve as the foundation of that discipline as guiding principles for their students’ conceptual development and instruction, rather than being guided by knowledge of the learning needs and developmental profiles of novices.” This effect relates to the fact that much of the knowledge that pertains to script development is deemed “tacit” knowledge, which, as noted above, is knowledge grounded in experience that helps individuals solve problems but is often difficult to articulate. Indeed, cognitive psychologists examining legal problem solving have recognized that such tacit knowledge influences much of...
the process. As Patel suggests, legal educators must take time to deconstruct their problem solving processes so that they can better educate their students. Once they are able to articulate their own problem solving frameworks, they will be better able to communicate these processes to students.250

d. Teaching Cognitive Flexibility

As noted above, expert reasoning can hinder accurate problem solving in that the use of scripts and schemata can cause problem solvers to be inflexible in their approach and overlook relevant information that someone employing less efficient backward reasoning would likely see.251 Cognitive psychologists suggest that, to join the benefits of scripting and flexibility, problem solvers need to learn how to “proceduralize flexibility.”252 Effective problem solvers must be able to differentiate between those situations in which they can use their schemata and those in which they need to adjust their proce-
dures to address complex or unusual problems.\textsuperscript{253} From this research, Krieger reasons, "The real value of skills training in law schools . . . 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."\textsuperscript{254}

Krieger's suggestion relates to the recommendation by legal scholars that law schools should train students in the elusive principle of "practical judgment."\textsuperscript{255} Training in such judgment is difficult because such judgment is inherently context specific and often involves tacit knowledge that relies heavily on experience and observation.\textsuperscript{256} Some legal scholars contend that, to teach such judgment, law schools should provide students with more simulation-based courses and clinical experiences.\textsuperscript{257}

In any increased emphasis on instruction in practical judgment, however, law schools must consider how such instruction takes time away from core instruction in domain knowledge, which is foundational to problem solving and in which law schools seem better equipped to instruct. Moreover, legal education must not overlook that all professions to some extent train their new members through the experiential observations they make as they begin their career.\textsuperscript{258} Indeed, if law schools determine that education in practical judgment and practical skills should be increased, one recently proposed option is for law schools to open their own law firms that hire their recent

\begin{footnotesize}
\begin{enumerate}
\item \textsuperscript{253} Krieger, supra note 36, at 205.
\item \textsuperscript{254} Id. at 206.
\item \textsuperscript{255} See Stuckey et al., supra note 2, at 149; cf. Marjorie M. Shultz & Sheldon Zedeck, LSAC Final Report: Identification, Development, and Validation of Predictors for Successful Lawyering 18-19, 26-27 (2008), available at http://www.law.berkeley.edu/files/LSACREPORTfinal-12.pdf (conducting comprehensive survey on behalf of the LSAC that listed "practical judgment" as one of the twenty-six effectiveness factors for successful lawyering).
\item \textsuperscript{256} See Stuckey et al., supra note 2, at 149; see also Edmund B. Spaeth, Jr., What a Lawyer Needs to Learn, in Tacit Knowledge in Professional Practice, supra note 154, at 21.
\item \textsuperscript{257} See Stuckey et al., supra note 2, at 150-57. Although the study did not assess students' improvement in "practical judgment" explicitly, Stefan Krieger conducted an empirical study of whether clinical legal education improved students' problem solving skills based on other measures. The study had mixed findings, finding that clinical education had both benefits and limitations in developing such skills. See Stefan H. Krieger, The Effect of Clinical Education on Law Student Reasoning: An Empirical Study, 35 WM. MITCHELL L. REV. 359, 394-98 (2008).
\item \textsuperscript{258} See Marchant & Robinson, supra note 249, at 3 ("[I]n the end, the legal profession, like most other professions, relies on the ad hoc nature of experience to guide junior members of the profession in the development of their expertise and competence as legal practitioners.").
\end{enumerate}
\end{footnotesize}
graduates, who would work there for fixed periods before moving to other career opportunities.\textsuperscript{259}

Regardless of whether instruction in practical judgment is a curricular emphasis, legal instructors could use more modest techniques to teach flexibility in problem solving. For instance, instructors could promote flexibility by discussing at least one comprehensive problem solving framework relating to doctrinal information to which the students have already been exposed. The instructors then could explain how that framework applies to a complex problem, preferably an actual case or dispute.\textsuperscript{260} By explicitly applying a problem solving framework to a complex problem, instructors would be promoting flexibility and contextualizing their instruction in a way that fosters students' problem solving transfer to other areas.

IV. THE ROLE OF PRACTICE

A. PSYCHOLOGICAL RESEARCH ON EXPERT PERFORMANCE

In addition to the above pedagogical principles relating to the development of expertise, over thirty years of research in educational and cognitive psychology have shown that "experts are made, not born."\textsuperscript{261} Specifically, although talent and intelligence are factors in expertise, individuals who become high-level experts do so primarily due to many hours of sustained and deliberate effort.\textsuperscript{262} K. Anders Ericsson, a Florida State University professor who has been called "the expert on experts,"\textsuperscript{263} posits the "ten-year rule," which shows that even innately talented individuals need ten years of deliberate practice in domain-related activities to acquire true expertise.\textsuperscript{264} Other researchers surveying various fields have similarly concluded that ten


\textsuperscript{260} Cf. Stuckey et al., supra note 2, at 153 (describing specific methods instructors could use to expose first-year students to law practice without much expense or time).

\textsuperscript{261} Schraw, supra note 30, at 257.

\textsuperscript{262} Id. (adding that "[s]ustained practice even without pronounced native ability may be sufficient for very high levels of skill development"). Educational and cognitive psychologists have differed on the extent to which deliberate practice and talent interact to lead to expertise. Id. at 257-58. Some researchers emphasize the role of deliberate practice. See, e.g., Ericsson, supra note 37, at 31-83. Others emphasize the role of talent. See, e.g., Ellen Winner, The Origins and Ends of Giftedness, 55 Am. Psychologist 159 (2000). Nevertheless, most psychologists recognize that deliberate practice at least plays a role in the development of expertise. See, e.g., Devine & Kozlowski, supra note 155, at 294; Schraw, supra note 30, at 255.


\textsuperscript{264} Ericsson, supra note 37, at 65.
thousand hours is the special number of hours needed of practice for high-level expertise.\textsuperscript{265}

The common expression “practice makes perfect” conveys this general sentiment that more practice is better. Psychological studies that have examined the development of expert problem solving, however, show that individuals who obtain domain-specific knowledge and remain active in that domain do not necessarily achieve the same level of performance.\textsuperscript{266} Empirical research of individuals in many different disciplines shows that individuals engaged in problem solving often stagnate in their development when they reach a level of “generalized automaticity” in which the skills involved in problem solving become fixated as individuals lose conscious control over the skills and fail to modify them intentionally.\textsuperscript{267} Experts who rise above this stagnation deliberately acquire and refine the cognitive skills important to the problem solving at issue. Essentially, they consistently set new goals for themselves and engage in cognitive problem solving by ascertaining what aspects of their current performance need to be changed in order to advance.\textsuperscript{268} For instance, studies of chess experts demonstrate that they consistently challenge themselves, spending as much as four to five hours a day studying games between chess masters.\textsuperscript{269}

Practice or experience in a domain generally does not lead to expert performance; “successful practice requires identifying specific goals for how to change the performance.”\textsuperscript{270} Ericsson therefore reasons that a critical component in the development of expert problem solving is “deliberate practice.”\textsuperscript{271} Individuals moving toward expertise take advantage of constructive feedback from others, as they engage in a process in which practice is followed by feedback and then by

\textsuperscript{265} \textsc{Malcolm Gladwell}, \textit{Outliers: The Story of Success} 39-40 (2008) (quoting neurologist, Daniel Levitin, as writing “[t]he emerging picture from such studies is that ten thousand hours of practice is required to achieve the level of mastery associated with being a world-class expert—in anything”).

\textsuperscript{266} \textit{Id.} at 61, supra note 37, at 61.

\textsuperscript{267} \textit{Id.} at 61, 74 (“[O]nce a sufficient level of experience and knowledge has been attained, the relation between additional experience and performance is weak.”).

\textsuperscript{268} \textit{Id.} at 66-67.

\textsuperscript{269} \textit{Id.} at 70-71 (citing K. Anders Ericsson et al., \textit{The Role of Deliberate Practice in the Acquisition of Expert Performance}, 100 \textsc{Psychol. Rev.} 363 (1993)).

\textsuperscript{270} \textit{Id.} at 73 (emphasis added). Research in perceptual-motor domains, like piano and ballet, further shows that individuals who fail to master the fundamentals correctly in the beginning face obstacles down the road when imprecision in the fundamentals will frustrate performance. \textit{Id.} at 70. Legal educators might analogize these results to law school instruction in order to advocate that law schools must concentrate on training law students in the fundamentals of legal doctrine and analysis so that they have the building blocks needed to perform complex legal problem solving.

\textsuperscript{271} \textit{Id.} at 63.
more practice and so on. In surveying the research on deliberate practice, Geoff Colvin has summarized the principle by the following elements:

It is activity designed specifically to improve performance, often with a teacher's help; it can be repeated a lot; feedback on results is continuously available; it's highly demanding mentally, whether the activity is purely intellectual, such as chess or business-related activities, or heavily physical, such as sports; and it isn't much fun.

In relating these findings to the educational context, educational research has proven that successful learners engage in metacognitive strategies in which they continually monitor and then regulate and improve their tactics for learning. Such processes are called “self-regulated learning.” In order for learners to engage in such strategies, they need to have metacognitive knowledge, or knowledge about their own thinking process. This knowledge translates in the classroom environment into knowledge about what the learners know or do not know about a certain subject.

In seeking to improve their learning, students engage in a variety of particular tactics. Research has indicated that, in general, certain tactics are more effective than others. For instance, reading and re-

272. GEOFF COLVIN, TALENT IS OVERRATED: WHAT REALLY SEPARATES WORLD-CLASS PERFORMERS FROM EVERYONE ELSE 70 (2008); see also Corie L. Rosen & Hillary Burgess, More than Merely Doing: Deliberate Practice, Feedback, and Academic Success, LEARNING CURVE (Ass'n of Am. Law Sch. Section on Academic Support), Spring 2011, at 2-4 (discussing the importance of practice and feedback to law students' academic success).

273. Ericsson, supra note 37, at 75. Ericsson also emphasizes that “planning” and “anticipation” are important attributes of expert problem solving. Id. at 61.

274. COLVIN, supra note 272, at 70, quoted in Rosen & Burgess, supra note 272, at 2. Ericsson applied this principle of deliberate practice in discussing an expert in medicine:

Medical diagnosticians see a patient once or twice, make an assessment in an effort to solve a particularly difficult case, and then they move on. They may never see him or her again. I recently interviewed a highly successful diagnostician who works very differently. He spends a lot of his own time checking up on his patients, taking extensive notes on what he's thinking at the time of diagnosis, and checking back to see how accurate he is. This extra step he created gives him a significant advantage compared with his peers. It lets him better understand how and when he's improving.

Collier, supra note 263, at 106.

275. See Cao & Nietfeld, supra note 69, at 31-32; Elaine M. Justice & Teresa M. Dornan, Metacognitive Differences Between Traditional-Age and Nontraditional-Age College Students, 51 ADULT EDUC. Q. 236, 238 (2001).

276. Cao & Nietfeld, supra note 69, at 31; see also MICHAEL HUNTER SCHWARTZ, EXPERT LEARNING FOR LAW STUDENTS 27-32 (2005) (discussing three phases in the self-regulated learning cycle).


278. Id. at 32.
reading the textbook is an ineffective approach to learning because it is not active and does not lead to deep processing of the information.\textsuperscript{279} In contrast, research has found positive correlations between active learning tactics and academic performance.\textsuperscript{280}

B. IMPLICATIONS FOR LAW SCHOOL PEDAGOGY

Law school is not designed to graduate "expert" legal problem solvers because, as noted, practical judgment develops over time and with experience.\textsuperscript{281} Moreover, the vast majority of the ten thousand hours of practice needed for high-level expertise are better saved for the professional work setting as law school curricula are already being asked to do more and more.\textsuperscript{282} With this said, legal education must do its part in promoting problem solving expertise among its students by providing them with an instructional environment that helps them develop expert skills. Legal education must provide problem solving practice opportunities during law school, and given the primary role of "deliberate practice" in the development of expertise, legal instructors must concentrate on the extent to which they provide students with such practice opportunities. The elements summarized by Colvin are important to highlight in the context of developing problem solving skills.

First, the practice must be designed to improve performance.\textsuperscript{283} Classic legal instruction primarily provides students with practice opportunities in the classroom, as it follows the educational research showing that effective learning involves both instruction in domain knowledge and working with that knowledge through concrete illustrations.\textsuperscript{284} Indeed, the traditional law school class hypothetical helps

\textsuperscript{279} See, e.g., Fergus I.M. Craik & Endel Tulving, Depth of Processing and the Retention of Words in Episodic Memory, 104 J. Experimental Psychol.: Gen. 268 (1975); A.M. Mackenzie, Examination Preparation, Anxiety and Examination Performance in a Group of Adult Students, 13 Int'l J. Lifelong Educ. 373 (1994). Derek Bok, in his 2005 book Underachieving Colleges, cites findings that students remember just twenty percent of the content of class lectures a week later. Caplan, supra note 10, at 63.

\textsuperscript{280} Cao & Nietfeld, supra note 69, at 32 (listing such active learning strategies as “making chapter notes, outlining, and coming to office hours”).

\textsuperscript{281} See supra notes 255-59 and accompanying text.

\textsuperscript{282} For instance, given the growing prominence in the role of the regulatory state, law schools are increasingly requiring courses in administrative law or related topics. See, e.g., McArdle, supra note 9 (describing how Harvard Law School revised its curriculum in 2008 to require its first-year students to take a course in legislation and regulation). See also Stuckey et al., supra note 2, at 73 (describing one aspect of the core knowledge of the law which law school graduates should possess as knowledge of “the regulatory and fiscal framework within which business and other legal transactions and financial services are conducted”).

\textsuperscript{283} Colvin, supra note 272, at 67.

\textsuperscript{284} See supra note 280 and accompanying text.
students apply the rules they are learning to novel situations.\textsuperscript{285} As a way to improve such illustrations to enhance learning and ultimately performance, cognitive psychologists add that instructors should employ "authentic" illustrations situated in complex contexts that motivate students towards learning.\textsuperscript{286} Furthermore, more and more law students are "Millennials," the generation that graduated from high school in 2000 or later.\textsuperscript{287} Millennials, compared with earlier generational groupings, are more inspired to learn when they see how their school-related tasks are strongly connected to real-life, authentic situations.\textsuperscript{288} To provide deliberate practice, illustrations and hypotheticals (indeed any practice opportunities) must also be in students' "learning zone" as opposed to their "comfort zone" or "panic zone."\textsuperscript{289} Legal instructors therefore should test students' domain knowledge by pressing them to think about authentic, line-drawing scenarios that challenge their understanding of the material. These scenarios, however, should not be so complex that they require students to use either problem solving skills or domain knowledge in which they have not been instructed; in facing such scenarios, students will be unable to connect their domain knowledge to the scenario in order to reach a solution. To highlight another of Colvin's elements, the practice must be "demanding mentally" but not so demanding as to frustrate the learning process.

Working through good illustrations in class, however, does not alone constitute deliberate practice for legal problem solving. Practice must indeed be practice; that is, students must actually work through the skills that are important to effective legal problem solving. A list of such skills used in legal problem solving is undoubtedly lengthy and potentially open-ended.\textsuperscript{290} In focusing the discussion in this Article on


\textsuperscript{286} See Anderson et al., supra note 46, at 9 (discussing arguments advocating that learning in a complex, social context is important to motivate students because they can see how their learning applies in such a context).

\textsuperscript{287} Lustbader, supra note 210, at 339-40.


\textsuperscript{289} Colvin, supra note 272, at 68 (providing terms adopted by Noel Tichy, a professor at the University of Michigan Ross School of Business). To be in the "learning zone," practice must push individuals to develop skills that are "just out of reach." \textit{Id.}

\textsuperscript{290} For instance, legal scholars have addressed numerous other aspects of developing problem-solving skills, such as the extent to which students should develop their "problem-finding" skills in attacking real-word, complex, ill-structured problems. See Bennett, supra note 40, at 45-82; see also supra notes 215-24 and accompanying text (discussing suggestions on the domain knowledge necessary for effective lawyering).
the core cognitive attributes important to legal problem solving, however, the question still arises whether students' listening to and thinking about hypotheticals in class provides them with the practice necessary to gain expert performance. Research across many disciplines suggests the answer is no.291

Even if students are exposed to instructional techniques, like hypotheticals, that enhance their metacognitive awareness, they may not adjust their learning strategies in order to improve their understanding of the doctrinal material. For instance, recent research on undergraduates found that the students' metacognitive awareness of difficulties in learning the class material did not automatically cause them to change their study strategies.292 Specifically, in research on students taking an educational psychology course in their junior and senior year, the students did not vary their study strategies based on the different kinds of learning difficulties they faced in the course. They consistently used rehearsal strategies, such as “reread[ing the] textbook chapter and study[ing] the lecture notes,” even when they encountered more challenging problems in the course, such as analyzing the classroom scenarios.293

Instructors therefore cannot rely on students' metacognitive awareness of their lack of understanding of course material to lead them to choose effective study strategies.294 At the law school level, where developing problem solving skills is key, instructors must be intentional about creating an educational environment that gives students insights into how best they should study.295 Moreover, instruc-

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291. See supra notes 263-74 and accompanying text (discussing the research of Anders Ericsson and others on expertise).
293. Id. at 38-39. The study involved ninety-four college students at a mid-size university in the southeastern United States. Id. at 33.
294. This proposition assumes that students, in fact, have such metacognitive awareness. In my work with students as part of our Academic Success Program, I tell them that "the power of denial is incredible" because students often deceive themselves into thinking that they understand the course material better than they actually do (an example of the general principle that we tend to judge ourselves by our intentions and not our actions although we tend to judge others by their actions and not their intentions). Students therefore first must become aware of their comprehension difficulties before they can choose the most effective strategies to increase their knowledge and improve their performance.
295. See Stuckey et al., supra note 2, at 127-28 (stating that legal education should help its students "improve their self-directed learning skills"). Not all instructor intervention is equally effective. Some research has shown instructors' efforts at promoting students' metacognitive awareness affects the students' metacognitive monitoring. See,
tors must consider how their assessment tools impact students’ study strategies and metacognitive awareness. One often-discussed way to create an environment that promotes students’ metacognition relates to another of Colvin’s elements of deliberate practice: Instructors must give the right level of feedback to their students. Educational researchers agree that frequent, prompt feedback and assessment promote effective learning. Learning has, in fact, been called a “loop in which teachers facilitate students’ active learning, students perform, and teachers provide feedback that shows students how their learning and performance can be improved.”

Assessment at the end of the semester often does not accomplish this goal; therefore, assessment must also be “formative” in providing students with feedback during the learning process so that they can complete the learning loop.

Legal educators have endorsed the use of practice problems and exercises in the course context. Working through such problems provides students with important practice that prepares them for the final exam and future problems. Effective deliberate practice, however, requires learners to engage in sophisticated self-reflection, planning, and redirection. Law students who are likely still learning the domain knowledge at issue cannot engage in such self-assessment; teacher feedback is therefore critical.

Methods to improve student feedback in law school have recently garnered much attention in the legal literature. In an effort to en-

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e.g., Robert G. Curley et al., Relationships Between Study Activities and Achievement as a Function of Grade Level and Course Characteristics, 12 CONTEMP. EDUC. PSYCHOL. 324 (1987). The Cao and Nietfeld study discussed in the text, however, did not show such a correlation. Cao & Nietfeld, supra note 69, at 39. In particular, the students in their study as a whole failed to exhibit metacognitive awareness even though the instructors “intentionally introduced the concept of metacognitive knowledge and skills, utilized weekly monitoring exercises to prompt students’ reflection on their understanding and selection of study strategies, and provided feedback on students’ test performances throughout the semester.” Id.

296. See Cao & Nietfeld, supra note 69, at 40 (discussing the relationship between course assessment and study strategy); Curley et al., supra note 295, at 384 (discussing the relationship between course assessment and study strategy).


299. Id. at 105-06.

300. See, e.g., id. at 107-09; Terri LeClercq, Principle 4: Good Practice Gives Prompt Feedback, 49 J. LEGAL EDUC. 418, 419 (1999); Paula Lustbader, Teach in Context: Responding to Diverse Student Voices Helps All Students Learn, 48 J. LEGAL EDUC. 402, 410-11 (1998).

301. See supra notes 271-73 and accompanying text.

302. For instance, the January 2011 issue of The Learning Curve, the newsletter of the Association of American Law Schools Section on Academic Support, contains several
courage legal instructors feeling overwhelmed with the prospect of giving extensive, individualized feedback to every student, Terri LeClercq in her article in the Journal of Legal Education offers several suggestions for feedback techniques that are not burdensome.\(^3\) Although she rightly contends that some feedback is better than none, the evidence is overwhelming that frequent, individualized feedback is what is most effective.\(^3\)

Legal educators may therefore seek to strike this balance by shifting some of the intentional feedback to law students themselves. The research indicates that students have difficulty developing self-regulated knowledge without instructor guidance,\(^3\) but requiring students to complete certain tasks during the course can at least enhance the self-regulation process.\(^3\) Legal instructors could, for instance, require students to complete practice problems during the semester; and as opposed to giving them individualized feedback, the instructors could provide students with sample answers they would use to assess their own responses. Instructors could also require students to form feedback groups in which students shared responses with each other and then used the sample answers to assess their classmates' responses.\(^3\) Regardless of the specific form of feedback, the research on deliberate practice underscores that law schools are not giving stu-

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\(^3\) See Learning Curve (Ass’n of Am. Law Sch. Section on Academic Support), Jan. 2011, available at http://www.aals.org/documents/sections/academicsupport/LearningCurveJan2011.pdf; see also Stuckey et al., supra note 2, at 235-63; Sullivan et al., supra note 2, at 162-84 (providing a critique of traditional law school student assessment techniques).

\(^3\) See LeClercq, supra note 300, at 418-21. In a world of constant time pressure, learners are charged with assessing how to make such practice most effective and how to know when time spent on additional practice would be better spent elsewhere. Such issues of efficiency and prioritization are perhaps the most difficult to teach in the classroom because their answers depend on so many variables that apply uniquely to each student.


\(^3\) See supra notes 292-93 and accompanying text.

\(^3\) Stuckey, for instance, recommends that students be required to keep reflective journals in at least one course during the first semester of law school. Stuckey et al., supra note 2, at 128.

\(^3\) These strategies would not be as effective as individualized feedback from the instructor, but they recognize the importance of students' developing their own skills in being able objectively to evaluate their own work and the work of others. Cf. Owasso Indep. Sch. Dist. No. 1-011 v. Falvo, 534 U.S. 426, 433-34 (2002) (holding that student peer grading did not violate the Family Educational Rights and Privacy Act ("FERPA"),
dents the practice needed for problem solving in the profession unless schools provide them proper feedback while they are in school.308

Finally, as Colvin highlights, deliberate practice must be repeated a lot.309 Indeed, the ten-year rule and ten-thousand-hour principle stress that a little practice does not produce experts—likely even experts in training. Although the process of developing legal problem solving expertise is different from hitting hundreds of golf balls a day to become a pro golfer, it is more analogous than one might think. The basic principle still applies that a huge amount of practice is needed for expertise. Legal educators thus must critically consider the extent to which law school is providing this practice, and in turn, they must revisit the apparent tension between the amount of time they devote to practice in problem solving skills versus the amount of time they devote to instruction in domain knowledge, or “course coverage.”

V. EFFECTS ON COURSE COVERAGE

Discussions like those in this Article on how to improve law school pedagogy may frustrate many legal instructors. The old adage “easier said than done” comes to mind given the pressures legal educators face to cover a certain amount of domain knowledge, or doctrinal content, in their classes. In her book, Learner-Centered Teaching, Maryellen Weimer surveys the literature on learning to discuss the role of content in instruction. She powerfully argues that higher education’s “race to cover content” has negative effects on both students and their instructors.310 She adds that “so much knowledge exists now that it is impossible to teach students everything they need to know about anything” and that therefore teaching students how to be lifelong learners is critical in today’s educational landscape.311 Content, for Weimer, serves the dual roles of establishing a knowledge base and advancing learning.312

Teaching content is not separate from teaching learning. As discussed, extensive research in educational and cognitive psychology reasoning that such grading can serve important educational goals, including enhancing students’ understanding of the material being assessed).

308. See supra note 300 and accompanying text (providing specific suggestions on how to improve feedback).

309. COLVIN, supra note 272, at 69.

310. MARYELLEN WEIMER, LEARNER-CENTERED TEACHING: FIVE KEY CHANGES TO PRACTICE 47-49 (2002); see also STUCKEY ET AL., supra note 2, at 66 (advocating that legal education should train students in “self-reflection and lifelong learning skills”).

311. WEIMER, supra note 310, at 49. Weimer adds, “If we aim to be learner-centered, content still needs to be a focal point of the universe, but it can no longer be the exclusive center, the only or even most important variable when it comes to instructional decision making.” Id. at 50.

312. Id. at 51.
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has demonstrated that students learn how to be better learners when those skills are taught in a doctrinal context.\textsuperscript{313} This research underscores the benefit of what has become known as "active learning," in which students are actively engaged in the learning process by engaging in various techniques to get multiple senses involved during learning.\textsuperscript{314}

Underlying the assertion that content serves dual roles, however, is the question of whether instructors can cover the same amount of content and then simply "add-on" that coverage with instruction in learning. As Weimer recognizes, "[S]ome content must go."\textsuperscript{315} The plain reality is that effective problem solving instruction takes time—class time.\textsuperscript{316} In a classic article on legal education, Anthony Amsterdam recognized that law schools cannot increase their emphasis on developing students' analytical and problem solving skills without sacrificing some doctrinal coverage.\textsuperscript{317} Writing in 1984 on what he hoped law schools would look like in the twenty-first century, he remarked:

[By the mid-nineties . . . [p]eople began to ask why do we need to teach case reading and doctrinal analysis to the same students twenty-nine times \textit{sub nom.} torts, contracts, criminal law, admiralty, antitrust, civil rights, corporations, commercial law, conflict of laws, trusts, securities regulation, and so forth? Given the substantive proliferation, complexity, and fast-paced growth of modern law, it had been impossible to teach students the corpus juris, in any meaningful sense, long before the 1980s. . . . Was it not therefore a wiser deployment of scarce teaching resources to devote some of them to giving students a broader range of legal analytic methods

\textsuperscript{313} See \textit{supra} Part II. In addition to the studies discussed in Part II, studies of remedial programs in education generally have shown that students do not acquire learning skills nearly as well absent a doctrinal course context. \textit{Weimer, supra} note 310, at 53 ("There is not much motivation to think critically when there is no legitimate content to think about. There is not much motivation to work on skills that prepare for future encounters with content.").

\textsuperscript{314} See \textit{id.} at 52-53 (describing active learning generally as "that large repertoire of strategies and techniques designed to involve and engage students"). When I teach students how to be active learners, I emphasize how they should use more than one of their senses as they learn by, for instance, taking notes on course reading, developing questions about the material during reading, talking about the course material with fellow students, and crafting charts, outlines, or diagrams on the material.

\textsuperscript{315} \textit{Id.} at 54. Weimer adds, "Faculty are bright, curious, intrinsically motivated learners. If we cannot figure out how to organize our content more efficiently so that we have five minutes now and then to work on . . . developing our students as learners, then nobody can." \textit{Id.} at 71.

\textsuperscript{316} Even adopting the "shortcut" suggestions in this Article, focusing expressly on problem solving skills undeniably takes time away from class time that could be spent in discussing additional doctrinal material.

\textsuperscript{317} See Amsterdam, \textit{supra} note 20, at 618.
and skills, which would enable the students more effectively to acquire, understand, and use the substantive law, as they needed it, after they got out of law school?\textsuperscript{318}

Amsterdam acknowledged the political ramifications of such an allocation redeployment, but he likely underestimated the growing pressure law schools would face in the twenty-first century to prepare students for the bar examination.\textsuperscript{319} From the rise in influence of law school rankings to the changes in American Bar Association accreditation standards, law schools are facing mounting pressure to increase the bar passage rates of their students.\textsuperscript{320} Such pressure, in part, has fueled the rise of law school academic support and bar support programs; through such programs, law schools can provide overt instruction in learning or review of bar subject material, and they often do so as an additional program beyond the regular doctrinal course context so that students are exposed to the same amount of content as before the program's institution.\textsuperscript{321}

Even if these “add-on” approaches effectively contextualize skills development, they overlook the difficult issues of how problem solving methodologies can be better incorporated directly into doctrinal courses and what content coverage will have to be removed if done so. In his article titled “Teaching Reasoning,” Vincent Blasi cogently argues that law schools are so focused on content coverage that they are

\textsuperscript{318} Id.

\textsuperscript{319} See Weimer, supra note 310, at 67.

\textsuperscript{320} See Jellum & Reeves, supra note 133, at 647 (reasoning that “many law schools have become increasingly concerned about the bar passages [sic] rates of their graduates”). For instance, in 2007 the American Bar Association changed its Standards for Approval of Law Schools to codify specific bar passage rate standards with which a law school must comply in order to demonstrate, pursuant to Standard 301, that it is “maintaining an educational program that prepares its students for admission to the bar.” See ABA Standards, supra note 6, at 18-20. The Standards Review Committee is currently considering adding an interpretation to Standard 301 to clarify that even satisfying the specific bar passage rate standards is not conclusive evidence that a school has complied with Standard 301. See SRC April '12 Meeting Materials, A.B.A. STANDARDS REV. COMMITTEE, http://www.americanbar.org/content/dam/aba/migrated/2011_build/legal_education/committees/standards_review_documents/april2012/20120404_april12_src_meeting_materials.authcheckdam.pdf (last visited May 2, 2012).

\textsuperscript{321} For instance, Regent adopted for classes graduating in 2011 and later a new curriculum that requires many students to take a two-credit bar preparation course. See also Jellum & Reeves, supra note 133, at 647-48, 660-61 (noting that many law schools are instituting programs explicitly designed to improve the bar passage rate of their graduates and that many of these programs are connected with the schools' ASP). Certain ASPs do include instruction that is within a doctrinal course context. For instance, Seattle University School of Law conducts a seven-week ASP summer program prior to the first year in which participants take a Criminal Law course that covers not only doctrinal course material but also "academic and professional skills development." See SEATTLE UNIV. SCH. OF LAW, supra note 146; see also e-mail from Paula Lustbader to author, supra note 146 (discussing the program, which, in addition to covering substantive doctrine, "focuses on and explains various techniques of law school classroom pedagogy and their intended educational effects for students").
failing to teach students how to engage in “sustained analysis” where they patiently can track a commentator’s argument on one issue from start to ultimate resolution. He adds that this failure relates to law schools’ failure at prioritization—that legal instructors are too resistant to leave their “pedagogic[al] projects on the cutting room floor.” Roy Stuckey and others in Best Practices for Legal Education similarly recognize that most law school curricula “emphasize teaching substantive law far beyond core knowledge and skill and far beyond what typical law school graduates need to know and understand on their first day of practice.” They recommend that law schools and bar examiners “reconsider” the amount of doctrinal knowledge lawyers should have when they begin practice. Such reconsideration by bar examiners would likely lead to reconsideration by law schools, for schools often make curricular choices in response to the specific content coverage of the bar examinations their students take. The rise of the Multistate Performance Test is a promising start to reforming the bar examination so that it focuses less on doctrinal knowledge and more on problem solving, and similar reform efforts should be encouraged.

In addition to any such reforms, prioritizing the goals of legal education is certainly more important now than ever before as the information overload in modern society increases. To address this prioritization, when Harvard added three new courses to its first-year

322. Vincent Blasi, Teaching Reasoning, 74 CHI.-KENT L. REV. 647, 647-48 (1999). Blasi’s approach resembles the approach offered by Stephen Friedman. Friedman contends that law schools should present “practice-oriented education” in which students take several courses in a particular area in order to develop an understanding of the area’s “conceptual regime.” Friedman, supra note 17, at 93. He adds that even though students will focus on one regime, learning to navigate such a regime is a skill the students can transfer to another practice area. Id. at 91.
323. Blasi, supra note 322, at 653.
324. STUCKEY ET AL., supra note 2, at 75.
325. Id. at 76.
326. Since 2000, Regent University School of Law, for instance, has instituted several curricular reforms in response to its analysis of the subjects tested on state bar examinations and its students’ performance on those examinations.
328. See World’s Data, supra note 200 (discussing the growing amount of digital information transmitted each year). This information overload has led to the proliferation of multitasking, which studies show is less efficient than focusing on a single task at a time. See, e.g., Joshua S. Rubenstein et al., Executive Control of Cognitive Processes in Task Switching, 27 J. EXPERIMENTAL PSYCHOL.: HUM. PERCEPTION & PERFORMANCE
curriculum, including the problem solving course described above, it reduced from five to four the number of credits for the first-year doctrinal courses—property, contracts, torts, criminal law, and civil procedure. Others have addressed this prioritization by proposing aggressive changes to law school curricula that, for instance, transform the third year into an apprentice-type program that focuses solely on simulation and experiential-based instruction. In this prioritization, however, hours allocated to required courses need not be cut or course offerings of upper-level courses that are not simulation or experiential-based need not be trimmed. Instructors, instead, may adopt Blasi’s suggestion of scrutinizing the content coverage in individual currently-offered classes to make sure that coverage is balanced with explicit problem solving instruction. Whatever approaches legal educators adopt, they must take seriously the commitment to problem solving instruction. As addressed above, they must properly contextualize their discussion of problem solving and adequately ground students in domain knowledge so that their students can develop the necessary problem solving skills.

VI. CONCLUSION

Legal education is on the brink of a renaissance. One important factor in this impending change is a renewed recognition of the fundamental principle that teaching students how to think like lawyers involves teaching them how to solve problems like lawyers. Best practices for law school teachers now emphasize the importance of instructional models that promote students’ problem solving skills. Problem-based education has been adopted in other professional school contexts, like business and medical schools, and law schools

763-97 (2001) (finding multitasking to create inefficiencies in the switching of various tasks). Modeling prioritization thus has taken on new significance.

329. McArdle, supra note 9.

330. For instance, Washington and Lee School of Law recently transformed its curriculum by adopting a third-year program that is “entirely based on learning through engagement—combining practicum courses, practice simulations, client interactions, the formation of professional identity and the cultivation of practice skills.” See About the J.D. Program at W&L, Washington & Lee U., http://law.wlu.edu/admissions/page.asp?pageid=311 (last visited Sept. 2, 2011); see also Stuckey et al., supra note 2, at 280-81 (recommending a third-year curriculum in which “most courses could be organized as simulated law firms in which students work individually and in groups to solve legal problems”).

331. See, e.g., Lauren Carasik, Renaissance or Retrenchment: Legal Education at a Crossroads, 44 Ind. L. Rev. 735, 736-38 (2011) (arguing the legal education is a crossroads that may lead to renaissance or retrenchment depending on how the legal academy responds to the calls and pressures for change).

332. Stuckey et al., supra note 2, at 141-57.

333. Id. at 145.
should thus critically reflect on how problem solving instruction should be enhanced in their curricula.

In this reflection, legal educators must not overlook foundational principles in educational and cognitive psychology, where research on problem solving is flourishing. Law schools must first recognize that, in order to promote problem solving transfer, instruction in problem solving must be properly contextualized in a doctrinal course where instructors offer students multiple analogs and explicitly discuss with students the issues that impact how the knowledge might be transferred. In this recognition, law schools must acknowledge that stand-alone courses or academic support programs focusing on problem solving can be successful in developing that skill but only if they are explicitly tied to domain knowledge that relates to material in students' doctrinal classes. Second, law schools must accept that solid education in domain knowledge is a precondition to skill development in problem solving. They therefore must wrestle with the balance between skills and doctrine and examine whether their skills and clinical instruction is requiring students to engage in problem solving for which they have an inadequate doctrinal base. Finally, law schools must appreciate the role of deliberate practice in problem solving development. They must consider how deliberate practice relates to metacognitive awareness and how they can utilize new techniques to improve feedback and assessment so that students can become self-regulated learners.

Educational and cognitive psychology undoubtedly has much more to say about how legal instruction can be improved. The primary principles discussed in this Article represent a good place to start serious reexamination of law schools' problem solving instruction. Recent literature proclaims the benefits of instruction in legal problem solving; now law schools must implement such instruction and confront the costs it may exact on doctrinal coverage. Perhaps Anthony Amsterdam's description will come true after all.

334. See Anderson et al., supra note 46, at 7.
335. See supra Part III.
336. See, e.g., Mayer & Wittrock, supra note 30, at 289-96 (discussing particular instructional methods that enhance problem solving).
337. See, e.g., Stuckey et al., supra note 2, at 141-46; see also Myron Moskovitz, Beyond the Case Method: It's Time to Teach with Problems, 42 J. LEGAL EDUC. 241 (1992) (providing the foundational discussion for much of the recent literature on problem solving instruction in law schools).