

# THE SOCRATIC METHOD AND THE MATHEMATICAL HEURISTIC OF GEORGE PÓLYA

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## INTRODUCTION

What can an eminent mathematician teach law professors? A good deal—if we just ignore the math.

The Socratic method, once the staple of legal teaching and perhaps the popular conception of the law classroom, is declining in popularity and use.<sup>1</sup> The reasons are many,<sup>2</sup> but they do not occupy our thoughts here. This Article is not about weighing the benefits and drawbacks of the Socratic method, a debate that has been well covered.<sup>3</sup> The decline in the use of the Socratic method

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<sup>1</sup> See Orin S. Kerr, *The Decline of the Socratic Method at Harvard*, 78 NEB. L. REV. 113, 113–14 (1999) (“Despite this perception, the traditional Socratic method is today more myth than reality.”); see also Donald G. Marshall, *Socratic Method and the Irreducible Core of Legal Education*, 90 MINN. L. REV. 1, 2 (2005) (“The fact is that teaching and learning by genuine dialog has all but disappeared from the second and third years of law school, and is fast disappearing from the first.”); Burnele V. Powell, *A Defense of the Socratic Method: An Interview with Martin B. Louis (1934–94)*, 73 N.C. L. REV. 957, 967 (1995) (“It is clear to me that the Socratic method is dying.”).

<sup>2</sup> See, e.g., Susan H. Williams, *Legal Education, Feminist Epistemology, and the Socratic Method*, 45 STAN. L. REV. 1571, 1573–74 (1993) (opining on problems associated with the Socratic method).

<sup>3</sup> See Alan A. Stone, *Legal Education on the Couch*, 85 HARV. L. REV. 392, 406–18 (1971) (discussing the debate over the Socratic method); see also Kerr, *supra* note 1, at 115–22 (explaining that there has been a decline in the use of the Socratic method at Harvard Law School). I do not give “Socratic method” a precise definition that connotes a specific pedagogical form, as I, like many others, believe that the Socratic method is a chameleon, taking on the personality of the teacher and the students. See Marshall, *supra* note 1, at 12–14. It is loosely defined here as a teaching method done primarily through a dialogue between teacher and student, as compared to lecturing or experiential learning. See *id.* at 8; see also Kerr, *supra* note

is unfortunate because a dialogue between teacher and student is the essence of teaching and learning. The Socratic method is traditionally perceived as a teaching tool. But it is more than that. This Article shows that, once learned, it can be a concrete analytic tool for the student. In other words, it is an end unto itself rather than merely a means. Of course, its spiritual root is grounded in philosophical inquiry, a tradition still followed by many law teachers, but it can be adapted to a scientific framework for solving problems. Many years ago, the mathematician George Pólya showed generations of math teachers and students that problem-solving can be learned through the heuristic of simple questions that stimulate curiosity and creativity.<sup>4</sup> There is a connection between the Socratic method and techniques of mathematical problem-solving. This Article shows how Pólya's heuristic has application to the teaching of law, and thus it casts the Socratic method in a new pedagogical light.

Shortly into my law-teaching career, I learned that most law students dislike math. When we discuss a legal concept requiring mathematical thought, the student reception is invariably one of discomfort and disbelief that law practice can actually involve some computation or mathematical intuition.<sup>5</sup> I understand the frustration and skepticism.<sup>6</sup> Mathematics and legal analysis, however, share an important attribute—both are fundamentally problem-solving branches of knowledge.

In the field of mathematics, no scholar has been more influential in teaching problem-solving to generations of students than George Pólya. Not only was he a preeminent scholar of the twentieth century,<sup>7</sup> but he was also a passionate teacher who

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1, at 114 n.3.

<sup>4</sup> See G. PÓLYA, *HOW TO SOLVE IT: A NEW ASPECT OF MATHEMATICAL METHOD* 1–2, 5 (2d ed. 1957).

<sup>5</sup> In my classes, Torts, Business Associations, Corporate Finance, and Negotiations, basic mathematical intuitions arise more frequently than students prefer. Examples include complex causation, marginal costs, capital structure, asset valuation, expected value and probabilities, and basic intuitions of law and economics.

<sup>6</sup> See RICHARD A. POSNER, *CATASTROPHE: RISK AND RESPONSE* 205 tbl.4.1 (2004) (informing that only about 30 percent of law students at Columbia, Harvard, New York University, Stanford, University of Chicago, and University of Michigan have business, natural science, or technical backgrounds).

<sup>7</sup> See GERALD L. ALEXANDERSON, *THE RANDOM WALKS OF GEORGE PÓLYA* 171–92 (2000) (bibliography of Pólya's major works). In the appendix of the biography,

wrote wonderfully accessible books on the learning process.<sup>8</sup> In *How to Solve It*, he set forth a framework—a “heuristic” as he called it—for solving math problems. He wrote this book because no one before had adequately explained *how* to solve a math problem. Before his advances, a math teacher could explain a problem, demonstrate a proof, and assist students at each step, or she could let students struggle with the problem until they either succeeded or failed. It was either “sink or swim” or throw the students a fully inflated life raft. At best, students learned by repetition or quickness of wit; at worst, they failed for lack of proper direction or analytic framework and lost interest in the subject altogether. Thus, teaching the process of solving mathematical problems suffered from a lack of an understanding of “the mental operations typically useful in this process.”<sup>9</sup>

The difficulty of teaching how to solve problems is not unique to math. Law professors strive to develop critical analysis, a skill not emphasized enough in college education. From the student’s perspective, the first shock of law school is that the process of lectures, memorization, and regurgitation is alien to law school. At some point in their experience, they realize that analysis is more important than learning “the right answer.” The solutions to legal problems can be multivariate depending on the plausibility of the reasoning, and the problem-solving process is the education and the practice of law.

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Alan Schoenfeld provides an essay on Pólya’s contributions to teaching. In his career, Pólya was affiliated with—among other institutions—Cambridge, Oxford, and Stanford. Alan H. Schoenfeld, *George Pólya and Mathematics Education*, in THE RANDOM WALKS OF GEORGE PÓLYA, *supra*, at 233–36.

<sup>8</sup> See generally PÓLYA, HOW TO SOLVE IT, *supra* note 4; G. PÓLYA, INDUCTION AND ANALOGY IN MATHEMATICS: VOLUME I OF MATHEMATICS AND PLAUSIBLE REASONING (1954); G. PÓLYA, PATTERNS OF PLAUSIBLE INFERENCE: VOLUME II OF MATHEMATICS AND PLAUSIBLE REASONING (1954). My interest in Pólya came about serendipitously. I am not a student of math, nor am I particularly fond of the subject. During the research and writing of two articles on bargaining theory, I came across *Mathematics and Plausible Reasoning*, which set forth in an accessible presentation his theory of the nature of probability and plausible reasoning. See generally Robert J. Rhee, *A Price Theory of Legal Bargaining: An Inquiry into the Selection of Settlement and Litigation Under Uncertainty*, 56 EMORY L.J. 619 (2006); Robert J. Rhee, *The Effect of Risk on Legal Valuation*, 78 U. COLO. L. REV. 193 (2007). Pólya’s ideas were simple and plain—the kind one recognizes as having the quality of truth. After finishing my articles, I took an interest in Pólya and subsequently read his biography and *How to Solve It*.

<sup>9</sup> PÓLYA, HOW TO SOLVE IT, *supra* note 4, at 129–30.

To develop problem-solving skills, the traditional—and perhaps idealized—law school class is devoted to a dialogue, an intellectual journey whose end is sometimes unclear. One questions, one reasons, one arrives at tentative conclusions, only to question again. This quicksand-like process is the source of befuddlement and stress, particularly for first-year students. In the intellectual quest for the law, the student rightfully shares a substantial burden of discovery.<sup>10</sup> The Socratic method facilitates this process of learning. Classes can have the feel of a dialogue: the right questions, level of student participation, challenges, and disagreements among students and professor. At times, however, the method becomes stale or mechanical; an air of routinization can set in. We discuss the issue, holding, rationale and policy, and ask “but what if” or “but how about,” probing the limits of a holding or reasoning. But sometimes the dialogue seems to lack a grander design. It is easy to see how a repeated diet of the Socratic method can lead to a feeling of a monochromatic routine.<sup>11</sup> The hope is that the incremental accumulations of these sessions, enlightening or discouraging or tedious as they may be, become the building blocks for thinking like a competent lawyer.

The Socratic method emphasizes repetitive tasks: deriving issues, holdings, rules of law, policy, and principles. Additionally, the students' limits are tested through hypotheticals and professorial challenges.<sup>12</sup> Through this repetition, students learn the first level of legal analysis—the critical analysis of legal authority, case by case and statute by statute.<sup>13</sup> There is no doubt that students eventually learn this vital skill. Then there is the next level of legal analysis—the more complex task of weaving law and fact to form a persuasive

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<sup>10</sup> “Not having a right answer to write down in your notes can be extremely frustrating. First-year American law students have the same complaint. They, too, want certainty. They learn that they cannot have it. The better the law school, the less certainty, and the more students have to think for themselves.” GEORGE P. FLETCHER & STEVE SHEPPARD, *AMERICAN LAW IN A GLOBAL CONTEXT: THE BASICS* 10 (2005).

<sup>11</sup> See Steven I. Friedland, *How We Teach: A Survey of Teaching Techniques in American Law Schools*, 20 SEATTLE U. L. REV. 1, 32 (1996) (explaining how “a restlessness with the Socratic method is taking root”).

<sup>12</sup> See Kerr, *supra* note 1, at 114 n.3, 116–17.

<sup>13</sup> See *id.* at 117 (“With the Socratic reasoning process internalized, students become experts at critiquing their own prejudgments, leading to open-minded, bifocal, and sophisticated understandings of law.”).

theory of the case. The assumption has been that once students learn to analyze legal authority, they can take the next step of disaggregating a complex fact pattern and reconstituting the facts to support a case theory built on logical or plausible interpretations of the legal structure. Of course, we test for this in the final exam. On this second level of analysis, I am less sanguine. Students need a framework, a heuristic that puts the classroom process into a larger structure of a problem-solving process. The mechanical repetitions of the Socratic method, without more, may not always resonate with students,<sup>14</sup> who may find it difficult to connect the abstraction of case and policy analyses to the real world of messy facts and uncertain law.<sup>15</sup> If, however, the Socratic method is complemented with an understanding of a broader framework of the problem-solving process, students may connect the dots that go from the Socratic method to the analysis of legal authority, and finally to the construction of case theory.

My concern is not so much with whether students can learn to analyze discrete legal authority, but rather with whether they can combine analysis of facts and law in the ultimate task of legal problem-solving.<sup>16</sup> I distinguish case analysis, which involves the formulation of legal rules from primary sources (on the scale of skills a rather ordinary task), from case theory synthesis, which involves the complex task of problem-solving through the application of rules. My concern in this area arises from my experience. While teaching past courses in Business Associations and Civil Procedure, I gave short answer questions in the final exam in addition to long essay questions with complex fact patterns. The short answer questions presented

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<sup>14</sup> See Powell, *supra* note 1, at 967, 970 (noting student dislike of the Socratic method).

<sup>15</sup> See Kerr, *supra* note 1, at 119 (discussing Jerome Frank's criticism of "the Socratic classroom as an overly academic and library-focused product of Langdellian legal science" and noting that Frank thought "the true work of a lawyer consists of solving the real problems of real clients"). See generally Jerome Frank, *Why Not a Clinical Lawyer-School?*, 81 U. PA. L. REV. 907 (1933) (criticizing the conceptual teaching method in law schools and proposing a curriculum that would more strongly resemble the actual practice of law).

<sup>16</sup> Of course, this is from a litigation perspective, which is the predominant perspective for the first year curriculum. Core analytic skills are common to lawyers across all fields, but the focus can be different. For example, transactional lawyers focus on a different set of skills involving such things as drafting, negotiations, and economic structuring.

discrete problems that required the application of one or two rules of law, and they were used to test areas considered less important or miscellaneous. Students tended to perform very well on the short questions and the variance of the scores was low. Their performances suggest that as a class they studied hard. The distributions of performance in the long essays, however, were a broader distribution of good, average, and poor answers. The difference is that the long essay format required more sophisticated problem-solving skills such as sorting facts, organizing them, handling multiple rules, and picking their application.

The issue of problem-solving also came to light in an exercise conducted in another Civil Procedure class. Throughout the class, the case study method supplemented the Socratic method of teaching. The case study included numerous client interview notes, pleadings, motions, orders, letters, and other documents constituting a litigation file.<sup>17</sup> A weekend-long, take-home midterm was given in the format of additional documents and file materials, such as summary judgment motions, and the question simply asked the students to advise the client. Much to my surprise, when the problem was presented in this manner, the class as a whole performed poorly. Subsequent class discussion with students showed that they recognized and understood the issues, at least in compartmentalized form, but they had great difficulty putting the entire case together in a way that “solves the problem” for the client.<sup>18</sup> Without the stylized structure of a law school exam, in which the facts are neatly packaged and a specific call of the question is given, students struggled with the task of finding the relevant facts within a package of documents, putting them together, weighing them, identifying relevant issues, assessing the applicable law, and forming a theory of the

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<sup>17</sup> This case study was based on a real case I handled in private practice, but all documents were manufactured for the purpose of the exercise.

<sup>18</sup> When thinking about these issues, I recall an apropos scene from the movie *The Karate Kid*. Mr. Miyagi, the *sensei*, instructs his student Daniel to do various household chores—painting a fence, washing a car, scrubbing the floor—all in precisely instructed mechanical bodily movements. At the end of these tedious tasks, Daniel has mastered them. He is also tired and complains, believing there was no object lesson in the tasks other than doing Mr. Miyagi's chores. Only when Mr. Miyagi demonstrates that the precise mechanical movements are really a method of blocking and striking in karate does Daniel realize that the repetition of seemingly mundane tasks has an essential lesson.

case. In short, they struggled with the uncertainty and complexity of the assignment.<sup>19</sup>

With these experiences behind me as a relatively new professor, I came across *How to Solve It*. There, Pólya dispelled the notion that the process of solving a problem was deductive. Contrary to the conventional wisdom of the day, he showed that the process of solving problems is *inductive*, depending on educated guesses and messy intuitions that may or may not advance the problem. Legal problem-solving also involves an inductive process, where experience, analogy, trial-and-error, and motivation are just as important as logic and ordered deduction. Lawyers, like engineers or mathematicians, solve problems that are constrained by rules.<sup>20</sup> There are many views of legal analysis, of course, but one view is a scientific process of discovery: understanding the problem, discerning the knowns and the unknowns, applying related theorems or principles, and conducting a trial-and-error process of experimentation. Pólya argued for the application of this scientific process to the practice of mathematics.

#### I. MATHEMATICIAN, TEACHER, AND LAWYER (ALMOST)

A brief biography of Pólya is sketched to highlight a noteworthy point—that an abandoned legal career influenced, perhaps in a small measure, Pólya's thoughts about mathematics and teaching.<sup>21</sup> The law played a relevant role early in Pólya's life. His father became a lawyer after abandoning a career in medicine because he could not stomach the sight of blood.<sup>22</sup> Unfortunately, he was not a very successful lawyer despite

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<sup>19</sup> To some extent, this is a crossover problem shared with a school's legal writing program, which focuses on presentation and analysis. Presentation and analysis, like language and intelligence, are inextricably tied, but the doctrinal side of teaching bears a burden of teaching the mental process needed for good presentation. While the Socratic method is the best way to teach this mental process, the suggestion is that it can be better aligned with the goals of the case method in order to more fully prepare law students for their future work as attorneys.

<sup>20</sup> See Elizabeth Garrett, *Becoming Lawyers: The Role of the Socratic Method in Modern Law Schools*, 1 GREEN BAG 199, 201 (1998) (discussing the relationship between the Socratic method and problem-solving skills, and stating that ultimately, lawyers are problem-solvers).

<sup>21</sup> See generally ALEXANDERSON, *supra* note 7, for a full biography of Pólya's life.

<sup>22</sup> *Id.* at 9.

“brilliance and honesty,” as he had a habit of throwing “ink bottles at clients seeking legal excuses for ethically indefensible purposes.”<sup>23</sup>

Upon his father's death, Pólya's mother pressed him to follow in his father's footsteps and study law. Pólya dutifully did so, but soon abandoned the pursuit, because he found the study of law boring.<sup>24</sup> His intellectual interests then wandered through classic languages, literature, philosophy, physics, and mathematics. He ultimately chose to focus on mathematics, famously explaining, “I am not good enough for physics and I am too good for philosophy. Mathematics is in between.”<sup>25</sup> He was at first reluctant to devote himself to mathematics because his experiences with his pre-university math teachers were mixed.<sup>26</sup> His early experiences with teachers were influential as he came to value mentoring relationships. His career as a mathematician was marked by successful apprenticeships and partnerships with a number of mentors and collaborators. We get a sense for Pólya—the person, scholar, and teacher—from the following letter of recommendation by one such mentor, written early in Pólya's career:

First of all, there is Pólya. His way of doing mathematics is really completely foreign to me. He is to a lesser degree concerned with knowledge but rather with the joy of the hunt. However, I admire his brilliance extraordinarily. His ideas are certainly not of the type that would cast light on the major relationships of knowledge. His papers are rather single, bold advances toward very specific, limited points in an undiscovered land that will remain totally in the dark. But his questions are somewhat unusual. He is full of problems, and is an exceptionally stimulating person in mathematical circles. As an educator he may be somewhat hindered by his anxious desire to temper his investigations to well-defined, precise problems; however, he cares about his students in a way that is best described as “sincere fellowship.” As far as applied mathematics is concerned, he is especially strong in probability theory, and has also published in that field. In addition, he is very knowledgeable in applications (physics, statistics, etc.).

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<sup>23</sup> *Id.* at 10.

<sup>24</sup> *Id.* at 16.

<sup>25</sup> *Id.* at 17.

<sup>26</sup> *Id.* at 18 (relating how of Pólya's pre-university math teachers, “two were despicable and one was good”).



Overall, he is a very versatile guy (as far as I know, he studied the classics, law, and physics before becoming a mathematician); he is straightforward and doesn't wear blinders. I have the utmost respect for him as a person.<sup>27</sup>

This letter hints at the contributions Pólya would later make as a scholar and teacher. He enjoyed the "hunt" of the problem and preferred problem-solving to "vast theoretical constructs."<sup>28</sup> Like all great scholars, his ideas were original. In the field of teaching, he emphasized the importance of induction and plausible reasoning. Traditionally, mathematics was seen as a demonstrative branch of knowledge. Demonstrative reasoning is rigid and beyond controversy. No one can argue against the proposition that  $2 + 2 = 4$ , or that a well-written proof is a self-contained set of infallible logical statements. The premium is placed on rules and their manipulation into a logical sequence. On the other hand, induction and plausible reasoning are messy, fallible, and fluid. As a teacher, Pólya believed that the process of induction was inseparable from the field of mathematics:

We secure our mathematical knowledge by *demonstrative reasoning*, but we support our conjectures by *plausible reasoning*. A mathematical proof is demonstrative reasoning, but the inductive evidence of the physicist, the circumstantial evidence of the lawyer, the documentary evidence of the historian, and the statistical evidence of the economist belong to plausible reasoning.

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Mathematics is regarded as a demonstrative science. Yet this is only one of its aspects. Finished mathematics presented in a finished form appears as purely demonstrative, consisting of proofs only. Yet mathematics in the making resembles any other human knowledge in the making. You have to guess a mathematical theorem before you prove it; you have to guess the idea of the proof before you carry through the details. You have to combine observations and follow analogies; you have to try and try again. The result of the mathematician's creative work is demonstrative reasoning, a proof; but the proof is discovered by plausible reasoning, by guessing. If the learning of mathematics reflects to any degree the invention of

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<sup>27</sup> *Id.* at 38–41 (offering a letter of Hermann Weyl, written in 1921).

<sup>28</sup> *Id.* at 94.

mathematics, it must have a place for guessing, for plausible inference.<sup>29</sup>

One factor that influenced this philosophy is his early exposure to the law. Evidence of his understanding of the legal process appears in several parts of his works.<sup>30</sup> In *Induction and Analogy in Mathematics*, Pólya explains the basic source of plausible reasoning: "Experience modifies human beliefs. We learn from experience or, rather, we ought to learn from experience. To make the best possible use of experience is one of the great human tasks and to work for this task is the proper vocation of scientists."<sup>31</sup> This sentiment is a close kin to Oliver Wendell Holmes's exposition on the path of the law. Holmes believed that "[t]he life of the law has not been logic: it has been experience. . . . [I]t cannot be dealt with as if it contained only the axioms and corollaries of a book of mathematics."<sup>32</sup> Just as Holmes emphasized the importance of human events and influence—rational and irrational, avowed and unconscious—Pólya humanized mathematical reasoning, separating out and giving fair credit to the distinctly human intelligence of intuition, guessing, and plausible reasoning.<sup>33</sup> It is not logic alone or the skillful manipulation of rules that solves a difficult problem. Problem-solving requires inductive reasoning facilitated by a heuristic that stimulates the mental process. Thus Pólya, "the almost-lawyer," would have surely identified with the difficulties of mastering legal analysis and teaching it.

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<sup>29</sup> PÓLYA, *INDUCTION AND ANALOGY IN MATHEMATICS*, *supra* note 8, at v–vi.

<sup>30</sup> See PÓLYA, *PATTERNS OF PLAUSIBLE INFERENCE*, *supra* note 8, at 110 (discussing how rational people may come to opposite conclusions). Other mathematicians have also taken an interest in the process of legal analysis, particularly in the field of probability theory. See JOHN MAYNARD KEYNES, *A TREATISE ON PROBABILITY* 25–27 (6th' prtg. 1957) (discussing *Chaplin v. Hicks*, (1911) 2 K.B. 786 (U.K.)); see also M.G. BULMER, *PRINCIPLES OF STATISTICS* 6 (Dover Publications 1979) (1965).

<sup>31</sup> PÓLYA, *INDUCTION AND ANALOGY IN MATHEMATICS*, *supra* note 8, at 3.

<sup>32</sup> OLIVER WENDELL HOLMES, *THE COMMON LAW* 5 (Mark DeWolfe Howe ed., Harvard Univ. Press 1967) (1881).

<sup>33</sup> See PÓLYA, *PATTERNS OF PLAUSIBLE INFERENCE*, *supra* note 8, at 115–16. Pólya explained that demonstrative reasoning is "machinelike," whereas plausible reasoning is "human." *Id.* at 115.

## II. HOW TO SOLVE IT

Pólya synthesized his heuristic for solving mathematical problems in *How to Solve It*, which he wrote while at Stanford.<sup>34</sup> He set forth a four-step process, of which the first two are the focus here.<sup>35</sup>

*Understanding the Problem.* A student must understand the problem before she can solve it. This thought seems obvious, but many students attempt to solve a problem without first understanding it. Understanding the problem means more than understanding the question. Pólya asked as an example, “[What is] the diagonal of a rectangular parallelepiped in which the length, the width and the height are known?”<sup>36</sup> Even one who is wholly unfamiliar with geometry can understand the question being asked. But understanding the problem means that she must also know its essential nature. Pólya suggested that the teacher should guide the student with general questions: Can you restate the problem? What is the known? What is the unknown? What are the limiting conditions? These questions are meant not to lead the student towards the solution, something Pólya cautioned against, but to provide a framework to understand the nature of the problem.

*Devising a Plan.* No problem can be solved without understanding its essential nature.<sup>37</sup> Thereafter, the task is to devise a plan of execution. Pólya emphasized that knowledge builds upon itself: “We know, of course, that it is hard to have a good idea if we have little knowledge of the subject, and impossible to have it if we have no knowledge. Good ideas are

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<sup>34</sup> Since its publication in 1945, the book has become a classic in mathematics. It is one of Princeton University Press’s all-time best sellers. ALEXANDERSON, *supra* note 7, at 114. It remains in print today, has sold over a million copies, and has been translated into at least twenty-one languages. *Id.*

<sup>35</sup> PÓLYA, HOW TO SOLVE IT, *supra* note 4, at xvii, 12–19. The last two steps are entitled “Carrying out the Plan” and “Looking Back.” The former calls for checking each step of the solution. The latter calls for checking the solution and argument. *Id.* Obviously, these steps translate well to the exam-writing process and to general good habits of law practice.

<sup>36</sup> *Id.* at 7. A parallelepiped is a solid with six parallelogram faces that are parallel to the opposite face, e.g., a rectangular box.

<sup>37</sup> *Id.* at 6 (“It is foolish to answer a question that you do not understand. It is sad to work for an end that you do not desire. Such foolish and sad things often happen, in and out of school, but the teacher should try to prevent them from happening in his class.”).

based on past experience and formerly acquired knowledge.”<sup>38</sup> In solving a problem, the student may get a “bright idea” and solve it. If not, he must go about the more difficult task of finding the solution. Pólya suggested reasoning by analogy: Do you know a related problem? What is the unknown? Is there a smaller problem that can be solved? These questions stimulate the creative, inductive process, eliciting a series of educated guesses and intuitions, some of which may lead nowhere and some of which may advance the problem.<sup>39</sup> This process constitutes the steady, if not methodical, “hunt” for the solution.

The above method seems to border on the trite. On first pass, the guidelines seem too general to be helpful. Pólya cautions, however, against providing too much help to the student. Any help by the teacher must be “unobtrusive” and facilitate “the ability of the student and not just a special technique.”<sup>40</sup> He emphasized the importance of developing good “mental habit[s].”<sup>41</sup> The teacher’s role should be to “indicate a general direction and leave plenty for the student to do.”<sup>42</sup> His heuristic strikes a balance between providing no direction and too much help—both of which are easier forms of teaching—and in so doing, the teacher facilitates the development of the student’s mental habits.

Pólya’s heuristic casts a different, albeit subtle, light on the Socratic method. Understanding the problem is the first, and arguably most important, part of the problem-solving process. This is different from the traditional statement of the legal issue; which is a statement of the question that the court decided. While this statement is necessary, it also dresses the problem in

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<sup>38</sup> *Id.* at 9.

<sup>39</sup> PÓLYA, INDUCTION AND ANALOGY IN MATHEMATICS, *supra* note 8, at vi (discussing how Pólya believed that educated guessing was an essential ingredient to creative problem-solving, and quoting him as stating, “Certainly, let us learn proving, but also *let us learn guessing.*”).

<sup>40</sup> PÓLYA, HOW TO SOLVE IT, *supra* note 4, at 21.

<sup>41</sup> *Id.*

<sup>42</sup> *Id.* at 4. Donald Marshall also expressed a similar sentiment. He believed that the teacher should:

provide students with less subtle clues to the existence and nature of the misconception and . . . expedite the timing and impact of the restorative part of the dialog. However, the teacher who modifies Socrates’s technique must be ever alert to the danger of significantly diminishing student self-discovery, and to the ultimate sin of making the dialogue avuncular.

Marshall, *supra* note 1, at 12.

legalism. Since tort law is one of my subjects, I use examples from torts class.<sup>43</sup> Consider a typical subject, the definition of intent in a case of battery. Of course, the easy case of battery is striking someone with the intent to harm. But cases can be more subtle. Consider the following three cases: a young child slightly kicked another child in a playful gesture after class was called to order, thereby causing an unexpectedly severe injury;<sup>44</sup> a piano teacher, during a social visit, tapped the back of his student's shoulder with his fingers in a simulation of a piano technique, thereby causing an unforeseeable neurological injury;<sup>45</sup> a recreational football player jumped in the air to catch the ball, and upon coming down, stepped on another player's hand, breaking her fingers.<sup>46</sup> In the first two cases (the child and the piano teacher) liability arose, whereas in the last case (the football player) there was no liability.<sup>47</sup>

These cases make for great discussion. We can envision a traditional line of Socratic inquiry going something like this: What is the issue in these cases? What are the holdings? Why should the young child be liable for just intending a slight kick in the course of horseplay? What if the piano teacher's intent was to swat away a fly and incidentally touched his student's shoulder? What did the football player intend to do? Do we have intent if an intentional touch has any injurious consequences? If not, what is the dividing line between liability and no liability? These and other questions would surely be implemented while utilizing the Socratic method. Trying to place myself in the frame of reference of a first year law student, in a sort of a Rawlsian "veil of ignorance," if you will, I would probably be confused by these questions. Confusion is not bad per se if there is resolution, however tentative. These questions are highly relevant, specific, *and* legalistic. No doubt that they are properly

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<sup>43</sup> For the past four years I have adopted WARD FARNSWORTH & MARK F. GRADY, *TORTS: CASES AND QUESTIONS* (2004). This casebook is outstanding in many ways. In particular, it approaches legal analysis as a cluster of related cases, which are sometimes seemingly contradictory, and the students must understand and organize these cases into a broader framework. Importantly, my students generally like the book.

<sup>44</sup> *Vosburg v. Putney*, 50 N.W. 403, 403-04, (Wis. 1891).

<sup>45</sup> *White v. Univ. of Idaho*, 768 P.2d 827, 828 (Idaho 1989).

<sup>46</sup> *Knight v. Jewett*, 275 Cal. Rptr. 292, 293 (Ct. App. 1990), *aff'd*, 834 P.2d 696 (1992).

<sup>47</sup> *Knight*, 834 P.2d at 712; *White*, 768 P.2d at 828; *Vosburg*, 50 N.W. at 404.

designed to train a student in the legal analysis of authority. No doubt also that subsequent analysis of policies underlying the rule of law would give students a better understanding of the social problem raised by these cases. I do not cast any criticism on this type of questioning.

But consider an alternative approach, one that Pólya might have taken were he a law professor: What is the problem in these cases? A student may respond, "The definition of intent." Not satisfied with this generic answer, which simply confirms the student understood the question, we can suggest that the student looks at the problem from a different way: What are the known facts in each case pertaining to the defendant's intent? The child was horsing around; class was called to order; the kick was only slight and not meant to hurt. The piano teacher wanted to demonstrate a piano technique; the student was not in class and did not consent to the touch; the student did not expect the touch. The recreational football player wanted to catch the football; he did not intend to break her fingers. What do these facts say about what intent means? The student may answer, "a specific intent to harm the other person is not needed for liability." What else is known? The football player was found not liable while the child and the piano teacher were found liable. We circle back to the original question: What is the real problem here? The student may answer, "We have to define intent." What are the "knowns" about the definition so far? And what are the unknowns? This is the essential problem of intent, and the student now bears the burden of solving the problem. After more thought, she may frame the problem differently. Intent could have several definitions: Is it the intent to harm another? The intent to do the act that causes the harm? Or the intent to cause an unlawful contact? Once the problem is understood, the student has made substantial progress toward understanding the solution and the difference between intentional torts and negligence.

In presenting these alternative approaches, the suggestion is not that the two lines of dialogue are radically different—they are not. In actuality, there is more commonality than difference. Rather, there is a subtle change in tone and focus. The traditional Socratic dialogue is specific and employs the common language of legal analysis: recitation of material facts, statement of the issue, derivation of holding and rule of law, and analysis of

reasoning and policy and their limits. The focus is on the distillation of rules and principles. The dialogue is familiar and thus routine. The alternative approach denudes the inquiry of legalism, and instead focuses on restating the problem to one of definitional ambiguity. Both approaches seek the same result, but come at the problem from slightly different angles. There may be times when the traditional Socratic dialogue can be supplemented by focusing on understanding the problem and restating it beyond simply a statement of the issue and legal policies surrounding the judicial decision.

Devising a plan is Pólya's second step to solving a problem. Here, he asks the student some basic questions: Do you know a related problem? Can you use the related problem? What is the unknown? Consider again a typical problem in torts. Virtually all students study *Palsgraf v. Long Island Railroad Co.*,<sup>48</sup> which set forth the classic debate on the scope of duty in negligence.<sup>49</sup> This topic is rich in theory and philosophy, and discussion should be lively. Once it is covered, many classes proceed at some point to a discussion of negligent infliction of emotional distress as a special problem in the area of duty. The traditional approach is to assign cases showing how the common law has muddled through this issue in regards to legal aspects such as physical impact, physical manifestation, zone of danger test, and bystander tests.<sup>50</sup>

An alternative approach could apply Pólya's heuristic of devising a plan. Before even assigning the case readings on emotional distress, we can provide the fact pattern from *Waube v. Warrington*,<sup>51</sup> an early and influential case establishing the zone of danger test. In *Waube*, a mother witnessed from afar her daughter being struck and killed by a car and the resulting shock led to severe emotional distress.<sup>52</sup> The student is asked to solve this social problem by constructing the rule of law with the knowledge they have accumulated thus far. What is the problem

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<sup>48</sup> 248 N.Y. 339, 343, 162 N.E. 99, 100 (1928).

<sup>49</sup> See *id.* at 343, 162 N.E. at 100.

<sup>50</sup> See generally Robert J. Rhee, *A Principled Solution for Negligent Infliction of Emotional Distress Claims*, 36 ARIZ. ST. L.J. 805, 813–23 (2004) (discussing the development of common law principles affecting claims for negligent infliction of emotional distress).

<sup>51</sup> 258 N.W. 497 (Wis. 1935), *overruled by* *Bowen v. Lumbermens Mut. Cas. Co.*, 517 N.W.2d 432 (Wis. 1994).

<sup>52</sup> *Id.* at 497.

here? After some discussion, which may be lengthy, the student identifies the social ramification of unlimited liability based on a "foreseeability of harm" standard, the ever expanding ripple of liability. The problem is balancing the desire to provide remedy and limiting social liability to tolerable levels.

Since emotional distress cases have not been assigned, devising a plan to solve this problem requires the student to work with limited knowledge. Does he or she know a related problem that raised these social issues? After some discussion, perhaps the student hits upon a vague resemblance to *Palsgraf*. What is the unknown? What did *Palsgraf* answer and what did it not answer? The student notes the differences in the injuries. Mrs. Palsgraf suffered a physical injury, but the mother's injury is emotional distress.<sup>53</sup> We can ask the student to devise a legal standard that "solves" the problem of emotional distress claims. The student guesses and intuits. One answer may be a blanket rule against liability. Another may be that only those who are especially close to the victim, like parents and siblings, should be allowed to recover. Still another solution may be that if Mrs. Palsgraf, who was a distance away from the brown package of explosives, cannot recover for her physical injuries, then certainly a mother who is standing afar from the accident should not recover either. Indeed, this last solution is the reasoning that undergirds the classic zone of danger test,<sup>54</sup> and in *Waube*, the Wisconsin Supreme Court analogized to *Palsgraf* on precisely this ground.<sup>55</sup> Thus, in the common law, there is direct lineage from *Palsgraf* to the zone of danger test.

All of the above solutions to the problem were tried by nineteenth and twentieth century judges.<sup>56</sup> By allowing students to create the solution to a difficult legal problem—by allowing them to replicate the mental processes of an early twentieth century judge without the benefit of case law in this area—the teacher stimulates the legal problem-solving skill more than a

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<sup>53</sup> While this is the common understanding, Mrs. Palsgraf's injury was a speech impediment presumably caused by nervous shock. See Rhee, *supra* note 50, at 848–49 and accompanying notes. Indeed, the original New York Times article covering the accident listed Mrs. Palsgraf's injury as "shock." *Bomb Blast Injures 13 in Station Crowd*, N.Y. TIMES, Aug. 25, 1924, at 1.

<sup>54</sup> See Rhee, *supra* note 50, at 849–50.

<sup>55</sup> 258 N.W. at 497–98, 501. I do not suggest that *Waube* properly applied *Palsgraf*, as it did not. See Rhee, *supra* note 50, at 806–23, 883.

<sup>56</sup> See generally Rhee, *supra* note 50, at 806–23, 883.



standard dialogue of case-by-case analysis. In some ways, the Socratic method of case analysis is a postmortem, which is fine for most occasions. Legal education encourages students to second guess judges who arrived at tentative solutions to social problems.<sup>57</sup> But sometimes it may be fun and educational for students to put on their mathematical hats, if only in spirit, and solve the problem through intuition, guessing, and analogy without the benefit of a judge's wisdom. If the student attempts to solve the social problem without the benefit of caselaw, the subsequent readings in this area will stimulate far greater critical thinking.

Ultimately, Pólya advocated creativity—not of the fictional, fanciful or unreasonable variety, or the innate kind that produces the unexpected “bright idea,” but the learned kind acquired through hard work and required to solve hard problems. His heuristic, while simple, is designed to stimulate the thought process in an “unobtrusive” manner: What is the problem? Can you restate it in your own words? What is known? What is unknown? What are the conditions? Is there an analogous problem? Can you use that solution to this problem?

This problem-solving approach lends itself to the “case method” of teaching.<sup>58</sup> As discussed, my experiences using case studies have been mixed. The problem in my class, as I have analyzed it, is that students depend too much on a structured

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<sup>57</sup> Cf. Powell, *supra* note 1, at 963–64.

<sup>58</sup> The case method of teaching is a major component of business school education. The Harvard Business School is most famous for developing the case study method, but other major business schools like the Wharton School use it on a frequent basis as well. The Harvard Business School collects, compiles and manufactures case studies that it then sells to other schools, professors, and students. See, e.g., Harvard Business Online for Educators, Harvard Business School Cases, [http://harvardbusinessonline.hbsp.harvard.edu/hbsp/case\\_studies.jsp](http://harvardbusinessonline.hbsp.harvard.edu/hbsp/case_studies.jsp) (last visited July 30, 2007). In law school, the case study method is applied less. The problem is that the development of a case study is labor intensive. Each case study entails the culling together of facts and documents that provides a rich portrait of an actual or manufactured case, allowing a student to become immersed in the problem at hand. If the case study method is used in law school, the professor most likely had a suitable case from prior practice or had to create one in her own initiative. There is not an institutional source from which case studies are collected and offered for use. Recently, the Stanford Law School has begun to manufacture and make available detailed, thoughtful case studies in environmental law. See Stanford Law School Case Studies Collection, <http://www.law.stanford.edu/publications/casestudies> (last visited July 30, 2007). The development, collection, and wide use of legal case studies to supplement the traditional law school case would be a wonderful advancement.

way of thinking about a problem. Structure comes not only in the form of the expectation of a traditional law school exam format, but also in the traditional way of analyzing case law utilizing the vehicle of the Socratic method. The Socratic method gives the impression that legal analysis is an abstract exercise in legal science as expressed in appellate opinions and devoid of the uncertainties and messiness of the real world of legal problems. The case method can be a wonderful pedagogical device that complements traditional case analysis. The Socratic method, modified by a problem-solving heuristic, may help students to transition from the abstraction of legal rules and principles to the concrete world of uncertainty and multidimensional plausibility of solutions. This transition is vital for the acquisition of legal problem-solving skills.

#### CONCLUSION

As a relatively new law teacher, I wrote this Article to sort out my own understanding of how to teach legal problem-solving skills within a Socratic dialogue. In my view, it is unfortunate that the teaching method is declining in popularity and use. The Socratic method, in whatever unique shape and personality given by the collaboration between teacher and student, is effective and it will be the mainstay of my teaching method for many years to come. But sometimes the dialogue can fall into a routine as method and frame of reference remain the same and predictable. Repetition is good for learning, but it can be stifling as well. By applying Pólya's problem-solving heuristic to legal teaching from time to time, we can vary the tone and cadence of the dialogue in subtle ways. We can change the language of the discussion, the frame of reference, and perhaps in due course the mental processes to analyze not only legal authority, but also the more complex legal problem of creating case theory. Moreover, a problem-solving approach to the dialogue may better complement other pedagogical methods, in particular the case study method. Writing this Article has allowed me to better understand the problem of teaching effectively through the Socratic method. As Pólya observed, if you do not understand the problem, you cannot solve it.