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LAW STUDENTS' UNDERGRADUATE MAJOR: IMPLICATIONS FOR LAW SCHOOL ACADEMIC SUPPORT PROGRAMS (ASPs)

Mark Graham* and Bryan Adamson**

I. INTRODUCTION

Law school academic support programs (ASPs) help students improve their skills in the study, analysis, and communication of their understanding of the law. Law students involved in first-year academic support courses spend much time, effort, and energy learning techniques such as case briefing, statutory analysis, course outlining, time and stress management, issue spotting, and exam preparation and performance.¹ By stressing these topics, academic support instruction aims to impart skills necessary not only for first-year examination performance, but for academic success throughout law school. Moreover, teaching the fundamentals of legal reasoning lies at the heart of academic support instruction.²

Of course, effective first-year performance and academic success throughout law school is largely dependent upon a student mastering the process of legal reasoning. While there are numerous definitions of legal reasoning (and much debate regarding these definitions), there are at least three fundamental reasoning skills that first-year students should be employing as they develop lawyering skills: inductive reasoning, deductive reasoning and analogical reasoning.³ These reasoning types (among other, more advanced concepts) are used in every facet of the first-year law school student's academic experience – for study, writing, classroom discussion, and examinations.

One longstanding assumption in both the legal academy and the legal profession is that three years of study develops or refines a student's capacity to rea-

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¹ In addition, many academic support programs address the Socratic Method, comparing and contrasting judge-made law and statutory or quasi-statutory law, collaborative learning, learning styles, or use of public policy.

² See generally KARL LLEWELLYN, *BRAMBLE BUSH* (4th ed. 1973).

³ RUGGERO J. ALDISERT, *LOGIC FOR LAWYERS: A GUIDE TO CLEAR LEGAL THINKING* (1989).

son within a legal framework.⁴ It is also assumed that a student body consisting of “capable” individuals (e.g., a high score on the Law School Admission Test (LSAT) and undergraduate grade point average (UGPA) being the primary measuring tools of capacity), should be intellectually equipped to understand and apply the tenets of legal reasoning.⁵ However, both assumptions neglect the fact that these individuals enter law school with a variety of educational backgrounds. As a result, three equally “capable” individuals with different undergraduate backgrounds – in, say, engineering, philosophy and nursing – all take the same Contracts, Torts, and Civil Procedure courses.⁶ Each of these individuals, regardless the level of success obtained in their respective fields, may bring to the classroom different levels of competency in legal reasoning.

Experience as a law school faculty member has shown that some students grasp the mechanics of legal reasoning early on. Other students begin to see the “big picture” while preparing for their first-semester examinations. Still others, though to a lesser degree, appear not to understand the framework of legal reasoning until much later in law school. Regrettably, there are always the unfortunate few who just never seem to “get it.”

This article addresses whether or not law students’ comparative educational backgrounds affect their ability to solve general deductive reasoning problems. This question leads to two broader issues: (1) whether any comparative differences in general reasoning competency affect a student’s ability to reason within a legal framework; and (2) whether a student’s reasoning competency remains static over three years of law school. This article addresses the first issue. At present, a separate study⁷ is being conducted to explore how general reasoning differences may influence a student’s ability to reason within a legal framework.

Whether law students’ educational backgrounds significantly impact legal reasoning skills is a question based on two relevant research studies within the cognitive psychology literature on reasoning and academic background, one at

⁴ In 1921 the American Bar Association adopted the recommendation of its Committee on Legal Education, that a law student’s course of study be three years. James P. White, *Legal Education in an Era of Change: Law School Autonomy*, 1987 DUKE L.J. 292, 294-95. Now, all ABA-accredited law school graduates must have completed six semesters of study. ABA Section of Legal Education and Admissions to the Bar, STANDARDS FOR APPROVAL OF LAW SCHOOLS, Standard 304(b)(1999).

⁵ Combined LSAT and UGPA measures have been widely and consistently used as the primary determinants in law school admission. ABA Section of Legal Education and Admissions to the Bar and the National Conference of Bar Examiners, *Comprehensive Guide to Bar Admission Requirements* (1999), Margaret Fuller Corneille and Erica Moeser, eds. at 17. Taken together, LSAT and UGPA scores are perceived to be the best predictors of law school success. Richard O. Lempert et al., *Michigan’s Minority Graduates in Practice: The River Runs Through Law School*, 25 LAW & SOC. INQUIRY 395, 459 (2000) (surveying research results). That perception is not without its critics. Michael A. Olivas, *Higher Education Admissions and the Search for One Important Thing*, 21 U. ARK. LITTLE ROCK L. REV. 993 (1999); Gregory Williams, *Transforming the Powerless to the Powerful: The Public Responsibilities of Law Schools*, 28 N.M. L. REV. 1, 14 (1998). This article, however, does not address the issue as to whether the LSAT and UGPA are valid tools for measuring knowledge, or reliable predictors of law school academic success.

⁶ See Lempert et al., *supra* note 5, at 395.

⁷ M. Graham & J. Corter, Dissertation Research (2001) (research on file with co-author Mark Graham).

the graduate level involving law students,⁸ and one at the undergraduate level.⁹ Considered together, these studies suggest that undergraduate training in the natural sciences or the humanities (as opposed to the social sciences) encourages the development of deductive reasoning and problem solving skills,¹⁰ both of which are integral to learning in legal reasoning.¹¹ In other words, undergraduate disciplines require and reinforce, to different degrees, specific reasoning types which may be beneficial to learning legal reasoning. However, no research to date has specifically addressed the connection between a law student's undergraduate study and its effect on legal reasoning.

This article contends that law school academic support programs could use undergraduate degree information¹² to assess differences in reasoning ability to a greater extent than they currently do. Proficient use of the data currently under examination could yield several advantages to academic support professionals:

1. ASPs could better identify, at the outset, those students who may best benefit from academic support programs;
2. ASPs would be afforded an additional tool with which to diagnose a student's academic support needs; and
3. ASPs could assist in the development of more efficient training for students enrolled in first-year academic support programs.

A brief description of deductive, inductive, and analogical reasoning is the first step in analyzing the relationship between general reasoning ability and law school performance. A study of the application of these principles of logic to the legal tasks of case briefing, case synthesis and use of analogy will follow. Initial research examining law students and deductive reasoning will be shown to suggest that undergraduate study does have an impact on a law student's ability to learn legal reasoning skills. The article will conclude with a recommendation that academic support educators incorporate undergraduate study in shaping learning programs.

II. REASONING TYPES

A. Deductive Reasoning

Deductive reasoning is a cognitive process whereby particular conclusions are reached through the application of general rules.¹³ The most familiar type of

⁸ Darrin R. Lehman et al., *The Effects of Graduate Training on Reasoning: Formal Discipline and Thinking About Everyday Life Events*, AM. PSYCH. 113, 434-43 (1988).

⁹ Darrin R. Lehman & Richard E. Nisbett, *A Longitudinal Study of the Effects of Undergraduate Education on Reasoning*, DEV. PSYCH. 26, 952-60 (1990).

¹⁰ *Id.*

¹¹ RUGGERO J. ALDISERT, *LOGIC FOR LAWYERS: A GUIDE TO CLEAR LEGAL THINKING* (3d ed. 1997).

¹² For purposes of this research, it must be said that undergraduate study is only a proxy for a whole host of characteristics of a student or learner. For example, it is reasonable to assume that a student's choice of undergraduate major reflects her learning goals, motivation and previous experience (including high school education). Concededly, there are inherent shortcomings in classifying undergraduate majors. Further research on this issue is currently under way.

¹³ ALDISERT, *supra* note 11, at 49.

deductive reasoning is the syllogism.¹⁴ A strict or categorical syllogism is composed of three propositions and three terms¹⁵ (a major term, minor term, and middle term), whereby each term is found in only two of the three propositions.¹⁶ The first, more general proposition is the “major premise” (sometimes referred to as the categorical premise).¹⁷ The second, more specific proposition is the “minor premise” (sometimes called the conditional premise).¹⁸ The third is the conclusion.¹⁹ To posit a valid deductive argument, the conclusion must entail the two premises: “if the premises are true, the conclusion *must* be true.”²⁰

Another form of deductive logic relates to “If-Then” conditional logic statements.²¹ Formally known as *modus ponens* (Latin for “affirming the form”)²² and *modus tollens* (Latin for “denying the form”),²³ this logic essentially proves a statement to be true by employing the contra-positive.²⁴ Like syllogisms, If-Then arguments are also comprised of three propositions – in this case, a conditional premise, a categorical premise, and a conclusion.²⁵ The conditional premise has two components: an antecedent (the “If” statement), and a consequent (the “Then” statement).²⁶

In making a valid *modus ponens* argument, the categorical premise *affirms* the *antecedent* of the conditional premise, and the conclusion *affirms* the *consequent* of the conditional premise.²⁷ To make a valid *modus tollens* argument, the categorical premise must *deny* the *consequent* of the conditional premise, and the conclusion must *deny* the *antecedent*.²⁸

B. Inductive Reasoning

Inductive reasoning is the cognitive process whereby observations lead the student to a general proposition.²⁹ The strength and certainty of the induction is dependent upon the number of relevant observations supporting or denying the

¹⁴ *Id.* at 46

¹⁵ A “term” is a word or phrase in a proposition.

¹⁶ ALDISERT, *supra* note 11 at 45-46. This is perhaps the most familiar type of deductive logic. Aldisert offers up the classic example of syllogistic reasoning: “All men (middle term) are mortal (major term). (major premise). Socrates (minor term) is a man (middle term). (minor premise). Therefore, Socrates is mortal (conclusion).” *Id.* at 46.

¹⁷ *Id.*

¹⁸ *Id.* at 45-46.

¹⁹ *Id.* at 45.

²⁰ *Id.* at 49; ROBERT E. RODES, JR. & HOWARD POSPESEL, PREMISES AND CONCLUSIONS: SYMBOLIC LOGIC FOR LEGAL ANALYSIS 5 (1997).

²¹ ALDISERT, *supra* note 11, at 159.

²² *Id.*

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ ALDISERT, *supra* note 11, at 159.

²⁷ A *modus ponens* argument, symbolically, can be illustrated as follows: “If A, then B. A, therefore, B.” *Id.*

²⁸ ALDISERT, *supra* note 11, at 159-60. A valid *modus tollens* argument would look like this: “If A, then B. Not B, therefore, not A.” *Id.* at 160.

²⁹ *Id.* at 93.

proposition.³⁰ This type of induction is commonly referred to as “induction by enumeration.”³¹ It should be noted that an inductive conclusion is not true, *per se*. Rather, the conclusion is “a proposition that is more probably true than not.”³²

C. Analogical Reasoning

Perhaps best viewed as mediating, or as lying somewhere between inductive and deductive reasoning, is analogical reasoning. Analogy can be generally described as reasoning “from the particular to the particular.”³³ Reasoning by analogy has the following steps: (1) a beginning premise, i.e., relevant facts and a conclusion; (2) a description of factual respects of similarity and difference between the referenced premise and the presenting problem; and (3) a judgment as to whether it is the similarities or the differences that are more important (rendering the analogy more or less plausible).³⁴

Reasoning by analogy is both inductive and deductive. Reasoning by analogy is inductive because it is a process which looks in part at particular characteristics of a scenario. In addition, analogical reasoning is similar to inductive reasoning because its purpose is not so much to prove a conclusion, but rather to show its degree of strength.³⁵ However, unlike inductive conclusions, the strength of the analogical conclusion depends not upon the *number* of similarities, but upon the *significance of relevant similarities*, as in deductive reasoning.³⁶ Reasoning by analogy is, thus, both deductive – because of its inherent degree of empirical soundness and its structural form – and inductive – because of its reluctance to assert truth.³⁷

Deductive, inductive and analogical reasoning are just three logic types, which allow persons to contemplate, process, understand, and communicate information. To be sure, these logic types play pivotal roles in the learning of law. Having set forth three primary reasoning types, the discussion now turns to examine how these types exist in the context of legal reasoning.

³⁰ James R. Murray, *The Role of Analogy in Legal Reasoning*, 29 UCLA L. REV. 833, 847 (1982).

³¹ ALDISERT, *supra* note 11, at 90.

³² *Id.* at 103. Induction entails (1) making a number of observations, and (2) arriving at a general proposition based on those observations. For example: Chair A has four legs; so do chairs B, C, D . . . and Z. Therefore, all chairs have four legs. Note that the conclusion is not absolutely true; indeed there are things we call chairs which, for example, have three legs. That fact, however, does not undercut the strength of the induction. Its strength lies merely in its *probability*.

³³ *Id.* at 93.

³⁴ STEVEN J. BURTON, AN INTRODUCTION TO LAW AND LEGAL REASONING 26 (2d ed. 1995).

³⁵ ALDISERT, *supra* note 11, at 51.

³⁶ Murray, *supra* note 30, at 853 (“The effectiveness of the analogy is based on the *relevance* of the similarities, not the *quantity* of similarities” and the “*significance* of the relevant similarity”) (emphasis added); ALDISERT, *supra* note 11, at 96-7; BURTON, *supra* note 34, at 25-44. Conversely, a conclusion negating the analogy turns upon the absence of relevant similarities.

³⁷ RODES & POSPESEL, *supra* note 20, at 335. A useful schematic: Case A, which states principle X, has characteristics of 1, 2, 3, 4 and 5; characteristics 1, 2, 3, and 5 are relevant to principle X; Case B has the characteristics 1, 2, 3, 4, 5 and 6; Case A and Case B share characteristics 1, 2, 3, and 5; characteristics 4 and 6 are irrelevant to principle X; therefore, it is most probable, principle X applies to Case B.

III. REASONING AND THE CONNECTION TO LAW SCHOOL SKILLS

A. Generally

Without question, the use of deductive, inductive, and analogical reasoning is used every day, in most every aspect, of a law student's academic life. For example, when creating a general rule from a series of cases, students reason inductively. When students read judicial opinions to determine whether facts set forth warrant the application of a particular legal principle, they employ deductive reasoning skills. And, when students are asked to compare a new set of facts to a former case (whether through a professor's hypothetical, writing a legal brief, or on an examination), they draw analogies through induction and deduction.

In his article "Skills Training in 'Legal Analysis': A Systematic Approach,"³⁸ Paul Wangerin addresses ways of teaching dialectical skills in substantive law school courses.³⁹ In laying the groundwork for his discussion, Wangerin first explores the meaning behind what is commonly considered the core goal of legal education: teaching students to "think [] like a lawyer."⁴⁰ After surveying other scholars' definitions, Wangerin goes on to distill these (if only slightly) varied interpretations of how "thinking like a lawyer" translates into "the use of facts, statutes, synthesis, analogies, policy, and apparent contradiction."⁴¹

Though Wangerin's discussion is primarily concerned with how these important skills are mastered, his categories provide a useful framework with which to illustrate the roles that deductive, inductive, and analogical reasoning play in law school learning, and legal reasoning generally. This paper focuses on two of the six skills Wangerin sets forth: synthesis and analogy. Before discussing these two skills, however, we first address the case method of instruction in order to lay a foundation for the discussion of synthesis and analogy.

B. Case Briefing and Reasoning Skills

In traditional law school courses, students are taught through the case method. Through analysis of judicial opinions, students learn the fundamental method by which legal rules are established.⁴² The case method also teaches students the reasoning processes that are employed when establishing these rules. To be sure, it is this latter outcome which makes the case method so valuable. In

³⁸ Paul T. Wangerin, *Skills Training in "Legal Analysis": A Systematic Approach*, 40 U. MIAMI L. REV. 409 (1986).

³⁹ Dialectical skills in legal education refer to the ability "to read and analyze cases and [] to construct legal arguments." *Id.* at 412. Case briefing, synthesis, and use of analogy are three dialectical skills addressed by Wangerin, which this article will discuss and apply. *See infra*, Section III.

⁴⁰ *Id.* at 415.

⁴¹ *Id.* at 430-31.

⁴² Of course, legal rules exist in other sources, e.g., constitutions, statutes, restatements, or learned treatises.

reading judicial opinions, students are constantly challenged to exercise and develop reasoning skills.

When a student briefs a case, both inductive and deductive reasoning skills are engaged. Each court decision has a rule of law as its source that attaches a "definite, detailed legal consequence to a definite, detailed state of facts."⁴³ In the common law system of rule making, general propositions are developed through inductive generalization. The legal principle established through inductive generalization then serves as the categorical premise to analyze the subsequent case. Moreover, the case itself may be reduced to a deductive argument. The case of *Girouard v. State*,⁴⁴ addressing the issue of criminal provocation, illustrates this point.

In *Girouard v. State*, Steven Girouard was convicted of second degree murder for stabbing his wife, Joyce, during a heated argument at their home.⁴⁵ The couple, who had been married for only two months at the time, were both army enlistees.⁴⁶ In the course of the argument, Joyce stated several times that she had never loved Steven, that their marriage was a mistake, and that she wanted a divorce.⁴⁷ At one point, Steven went into their bedroom, where he lay down.⁴⁸ Joyce followed him into the bedroom and climbed upon the bed and onto his back.⁴⁹ Then, while pulling his hair, she reiterated her earlier insults, and made disparaging remarks regarding his sexual ability.⁵⁰ Joyce also stated that she had filed charges against Steven for abuse which would result in his court-martial.⁵¹ Steven left the bedroom for the kitchen, retrieved a knife, and returned.⁵² After more argument, Steven stabbed Joyce nineteen times.⁵³

On appeal, Girouard contended that his wife's provocation should have mitigated his crime from murder to manslaughter.⁵⁴ The Court of Appeals upheld the trial court's murder conviction, affirming the rule that words alone are inadequate provocation to reduce a conviction of murder to manslaughter.⁵⁵

When applying inductive reasoning to the *Girouard* case, it is necessary to assume that a student has a general understanding of the underlying question, i.e., what, legally, qualifies as sufficient provocation?⁵⁶ In reading *Girouard*, a stu-

⁴³ ALDISERT, *supra* note 11, at 8 (quoting Roscoe Pound, *Hierarchy of Sources and Forms in Different Systems of Law*, 7 TUL. L. REV. 475, 482 (1933)).

⁴⁴ 583 A.2d 718 (1991). *Girouard* and subsequent cases discussed herein are taken from the casebook, CRIMINAL LAW AND ITS PROCESSES (6th ed., SANFORD H. KADISH & STEPHEN J. SCHULHOFER eds., 1995)

⁴⁵ 583 A.2d at 719.

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ 583 A.2d at 719.

⁵⁰ *Girouard v. State*, 583 A.2d 718, 719 (1991).

⁵¹ *Id.* at 720.

⁵² *Id.*

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ Several sources inform this understanding. Even if a student knows nothing about the *Girouard* case itself, she sees that it falls within Kadish and Schulhofers' discussion of "a. The Nature of Provocation. (I) Traditional Common Law Limits." KADISH & SCHULHOFER, *supra* note 44, at 411.

dent would consider that Joyce and Steven were husband and wife. The student might also note that Joyce stated: (1) she wanted a divorce, (2) she had never loved Steven, (3) Steven was sexually inadequate, and (4) she had filed abuse charges against him for which he would be court-martialed. The student would also observe that, at one point, Joyce initiated physical contact with Steven, and that some time shortly thereafter Steven stabbed Joyce nineteen times.

From these specific observations, the student might reason by induction (i.e., arrive at a general proposition based on particular observations⁵⁷) that, in cases such as *Girouard*, words alone are insufficient to provoke killing. However, the student's conclusion does not follow *absolutely*. The court in *Girouard* still could have found that Joyce's statements were indeed adequate to justify a successful assertion of provocation as an affirmative defense, particularly in a case where there was also physical contact. Regardless of the conclusion, it is most important to recognize that any conclusion yielded through inductive reasoning is only *more or less probable*.

Articulating a legal rule out of *Girouard* first requires reducing the opinion to its most essential elements. The legal rule discussed and applied in *Girouard* can be expressed in deductive form. Creating a deductive argument based on the syllogism, the student might state the following from the facts and holding of *Girouard*:

- Words uttered (middle term) by a victim, without more, are insufficient provocation (major term). [legal rule / major premise]
- Steven killed Joyce (minor term) because of words uttered (middle term). [fact / minor premise]
- Steven, in killing Joyce (minor term), cannot successfully assert provocation (major term) as an affirmative defense. [holding / conclusion]

In creating a deductive argument based on conditional logic, a *modus ponens* argument might go something like this:

- If Steven killed someone merely because of words uttered (antecedent), then Steven cannot successfully assert provocation as an affirmative defense (consequent).
- Steven killed Joyce merely because of words uttered.
- Therefore, Steven cannot successfully assert provocation as an affirmative defense.

A *modus tollens* form of the argument would read like this:

- If Steven can successfully assert provocation as an affirmative defense (antecedent), then Steven did not kill Joyce merely because of words uttered (consequent).

In addition, more likely than not, the student knows what "provocation" means. So, from these cues, the student goes into a reading of *Girouard* with some type of framework which informs her understanding.

⁵⁷ ALDISERT, *supra* note 11, at 93.

- Steven killed Joyce merely because of mere uttered.
- Therefore, Steven cannot successfully assert provocation as an affirmative defense.

Each of these schemes is deductively valid. In each argument, the categorical and conditional premises are true. Moreover, in each form, the conclusion follows logically from the premises.

From the above examples, it can be seen that both inductive and deductive reasoning play a role in briefing cases. Through these processes, it is also clear that distilling a judicial opinion to its most “essential” components enhances students’ understanding.

C. Legal Synthesis and Reasoning Skills

Legal synthesis refers to the process of bringing together several legal authorities to create a single proposition.⁵⁸ The ability to create and use legal synthesis is a skill that academic support programs typically seek to help their students improve upon,⁵⁹ since it is a skill essential to effective legal writing, and one that is commonly tested on law school examinations.

One type of legal synthesis involves fashioning legal propositions from a series of cases.⁶⁰ Instruction by the case method, to be sure, demands a capacity for legal synthesis. Properly employed, the case method enables a student to bring together legal principles established in a body of law. In practice, however, instruction in the case method may give the impression that legal rules established in judicial opinions stand independently, without need for reference to the case before or the case after. Of course, holdings arising out of judicial opinions do not stand alone. The law is dynamic, and each legal rule arising out of a case is a component of a larger, ever-evolving principle.

As Karl Llewelyn noted, when a student reads a case, she should be asking herself “what does this case add to what I already know?”⁶¹ Remarkably, many students experience great difficulty effectively placing cases in their larger contexts (synthesizing cases).⁶² The value of mastering the skill of synthesis, however, cannot be overstated.

Through review and analysis of judicial opinions, legal principles are developed.⁶³ Depending on particular facts, a subsequent case may have the effect of illuminating, modifying, expanding, or contradicting a principle. A subsequent case may leave the initial case wholly undisturbed, declare it invalid or inapplicable, or create an exception.⁶⁴ Placing a series of cases into a larger con-

⁵⁸ Wangerin, *supra* note 38, at 442-43.

⁵⁹ See, e.g., Academic support programs at the University of Denver, The John Marshall Law School, Case Western Reserve University and the University of San Francisco, which instruct in case synthesis or, alternatively, topic or course outlining.

⁶⁰ Wangerin, *supra* note 38, at 442-43.

⁶¹ KARL N. LLEWELLYN, *THE BRAMBLE BUSH: ON OUR LAW AND ITS STUDY* 54 (Oceana Publications, 3d ed. 1960).

⁶² See discussion, *infra*, at 25.

⁶³ Paul T. Wangerin, *Learning Strategies for Law Students*, 52 ALB. L. REV. 471, 518-19 (1988).

⁶⁴ *Id.*

text can also illuminate the progression or evolution of a legal principle. Regardless of what a subsequent case “does” to a legal principle, the ability to bring together a series of related cases under a single idea or proposition is critical to understanding the law.⁶⁵

Case synthesis involves inductive, deductive, and analogical reasoning.⁶⁶ Case synthesis begins with the inductive process of developing a legal rule arising out of several authorities.⁶⁷ In the process, the student simultaneously identifies the facts relevant to (or, those which induce) the rule. This rule provides the foundation (or the major premise) for which to review a subsequent case and distill the case to its deductive essence. From an analysis of four, five, or ten cases, the legal rules are fashioned to develop a “big picture” of the legal principle at issue. Analogical reasoning takes place by comparing, contrasting, and weighing particulars of the cases.

Revisiting *Girouard* provides a useful demonstration of case synthesis. To do so, however, it is also necessary briefly to examine three companion cases to *Girouard*.

In *State v. Shane*,⁶⁸ the issue was whether a voluntary manslaughter instruction to the jury was required where evidence was presented that the defendant killed his fiancée, with whom he lived, when she admitted her infidelity.⁶⁹ The court affirmed the rule espoused in *Girouard* that the victim’s words alone did not justify the defendant’s act.⁷⁰ In so doing, the court stated that no exception to this general rule would be created even under circumstances where the parties were in a close relationship.⁷¹ However, the court expanded on this rule by stating that, as an initial matter, a judge must determine whether the evidence at trial would reasonably support an instruction to the jury as to the lesser-degree offense of voluntary manslaughter.⁷²

The second case, *Maher v. People*,⁷³ represented a departure from the approach taken by the courts in *Girouard* and *Shane*. The court in *Maher* allowed for the possibility of the affirmative defense of provocation in circumstances where the victim was a third party, and where no precipitating physical contact between the victim and the defendant had occurred. In *Maher*, the defendant shot his victim one half hour after witnessing him engaged in a sexual act with his wife, and after being told by a witness that he had seen the victim and defendant’s wife similarly engaged the day before.⁷⁴ The trial judge rejected the evidence presented on the facts, and the court of appeals affirmed.⁷⁵

⁶⁵ *Id.* at 519.

⁶⁶ *Id.* at 519-20.

⁶⁷ *Id.*

⁶⁸ 590 N.E.2d 272 (1992).

⁶⁹ *Id.* at 274.

⁷⁰ *Id.* at 278.

⁷¹ *Id.*

⁷² *Id.*

⁷³ 10 Mich. 212 (1862).

⁷⁴ *Id.* at 216-17.

⁷⁵ *Id.* at 217.

The Michigan Supreme Court reversed. Unlike the *Shane* court, the court in *Maher* ruled that there could be circumstances – not involving physical assault upon a person – which could cause that person to act “in heat of blood.”⁷⁶ Yet the court also stated that a determination must be made as to whether there was sufficient “cooling time” between the act precipitating the passion and the act taken as a result.⁷⁷ The court held that while the trial judge should, as a matter of law, determine *what* is reasonable or adequate provocation (whether words or acts), the question as to *whether* reasonable or adequate provocation was *proven* should be a question of fact for the jury.⁷⁸

An act while under duress was considered in *People v. Casassa*,⁷⁹ the third companion case. The *Casassa* court was called upon to interpret a New York Penal Code provision in the context of a defendant convicted of murdering a young woman with whom, after dating casually, he had become obsessed. The code provision allowed an affirmative defense of “extreme emotional disturbance for which there was a reasonable explanation or excuse,”⁸⁰ which the trial court rejected. Interpreting this provision as intended to expand the range of circumstances under which a provocation defense would be allowed, the court of appeals nonetheless affirmed the trial court’s ruling.⁸¹ In so holding, the appellate court ruled that both the presence of extreme emotional disturbance and the reasonableness of that disturbance were questions of fact. However, the court found the former to call for a subjective inquiry, while the latter was to be determined under an objective standard.⁸²

From the holdings of these particular cases – *Girouard*, *Shane*, *Maher*, and *Casassa* – a general principle can be derived (i.e., synthesized). Typically, under common law, mere words uttered by a victim will not permit a defendant successfully to assert an affirmative defense of provocation. This is so even when the victim and defendant are in a close relationship. The law will recognize some acts committed in the heat of passion, but requires an evaluation as to whether sufficient “cooling time” existed to diminish motivation for the act. Furthermore, whether particular words, or in some cases acts, would give rise to reasonable provocation is a question of law for the judge to determine, with the determination as to whether sufficient provocation was proven is a question for the trier of fact. With the codification of what constitutes sufficient provocation, courts will now consider evidence which goes to a defendant’s subjective state of mind regarding the existence and degree of emotional duress. However, a trier of fact will still make a determination as to whether the defendant’s state of mind was objectively “reasonable.”

From this example, we see how effective case synthesis involves more than just “stringing together” case holdings. Effective case synthesis entails deriving an overarching legal principle from a series of particular cases through induction.

⁷⁶ *Id.* at 219.

⁷⁷ *Id.* at 223.

⁷⁸ *Id.* at 221-22.

⁷⁹ 49 N.Y. 2d 668, 404 N.E.2d 1310 (N.Y. Ct. App. 1980).

⁸⁰ *Id.* at 1314.

⁸¹ *Id.* at 1317.

⁸² *Id.*

Simultaneously, deductive reasoning is important in articulating the rule, relevant facts, and holding of each case. Finally, in considering the factual relationships between the cases to create a broad legal principle, reasoning by analogy is essential.

D. Analogy and Reasoning Skills

The use of analogy is one of the most critical legal skills to master.⁸³ It involves the examination of past case precedent and its application to a subsequent case or a new set of factual circumstances.⁸⁴ Unlike synthesis, the skill of legal analogy concentrates on the facts of a single past case, instead of the ideas, propositions or rules emerging from a group of past cases. Moreover, unlike synthesis, the skill of legal analogy focuses on the similarities and/or differences in the facts to determine whether a particular holding applies to the case at hand and to what degree.⁸⁵ In drawing a conclusion as to whether a legal rule should apply in the new circumstance, the *quality*, not the *quantity*, of similarities is the important consideration.

In legal reasoning by analogy, the starting point is the holding or broad principle from a past case. After identifying the principle arising out of the precedent, facts of the presenting case are examined and compared to the facts and circumstances which gave rise to the precedent. After factual similarities and differences are noted, a determination must be made as to the *significance* of the similarities and differences. Significance, in turn, is determined by evaluating whether facts are relevant or irrelevant, disputed or undisputed, or are provable or unprovable. Only then can an argument by analogy be said to be more or less plausible.⁸⁶

Reasoning by analogy is both inductive and deductive. As in induction, particular observations are made to reach a general conclusion.⁸⁷ In addition, like inductive reasoning, a conclusion reached by analogy does not necessarily follow, but is characterized as being weak or strong. Nevertheless, because reasoning by analogy entails both the identification and the weighing of relevant similarities and differences, analogical conclusions carry empirical credibility. So, while the analogical conclusion does not follow absolutely from its premises, it is, due to its empirical nature, akin to deductive logic.

Recalling the general rule of provocation from *Girouard*, *viz.*, that words uttered by a victim, without more, are insufficient grounds on which to assert a successful affirmative defense, the concept of reasoning by analogy can be illustrated. In an attempt to draw a plausible conclusion as to the relationship between *Girouard* and *Shane*, reasoning by analogy is useful. There are several

⁸³ ALDISERT, *supra* note 11, at 95.

⁸⁴ *Id.* at 12; BURTON, *supra* note 34, at 25-31; Wangerin, *supra* note 63, at 520. This is so because common law jurisprudence operates on the principle of *stare decisis*. The tenet to treat like-cases alike entails drawing analogies between past case precedent and presenting circumstances. See RODES & POSPESEL, *supra* note 20 at 333; BURTON, *supra* note 34, at 25-26.

⁸⁵ Wangerin, *supra* note 63, at 448-55.

⁸⁶ Murray, *supra* note 30, at 844.

⁸⁷ However, in analogical reasoning, what is induced is not a general proposition, but a particular one. ALDISERT, *supra* note 11, at 90-91.

factual differences between the cases. In *Girouard*, the parties were married; in *Shane*, the parties were not.⁸⁸ In *Girouard*, the couple had no children; in *Shane*, the parties had a child.⁸⁹ In *Girouard*, there was physical contact by the victim upon the defendant; in *Shane*, there was no such contact.⁹⁰ In *Girouard*, there was no admission of sexual infidelity by the victim, but a protracted argument; in *Shane*, there was such an admission, but apparently nothing more.⁹¹ In *Girouard*, the defendant stabbed his wife nineteen times; in *Shane*, the defendant strangled his fiancée.⁹²

To determine whether a plausible analogy can be drawn between *Girouard* and *Shane*, one must assess which facts were significant to the outcome of each case and whether the factual differences between them are significant. The words uttered by the victim were of a deeply personal, hurtful nature. In both, a close relationship existed (as inferred from the facts of marriage and/or cohabitation and the words uttered). In *Girouard*, some facts weighed (inductively) in favor of a conclusion that sufficient provocation existed (e.g., the physical contact). However, given the court's ruling, the following is clear: the fact that (1) Steven and Joyce were married; (2) Joyce had physically assaulted Steven; (3) Steven stabbed Joyce nineteen times; and (4) Joyce and Steven had engaged in a protracted argument just prior to Steven killing her – had no impact on the outcome of the case. That no such evidence was present in *Shane* compels the conclusion that *Shane* is plausibly analogous to *Girouard* in all relevant, significant respects.

IV. WHERE LAW STUDENTS FAIL TO REASON WELL

Despite deductive, inductive and analogical reasoning skills being an integral part of the law school learning process, professors see many examples of students who fail to properly demonstrate these skills. Whether responding to a hypothetical, drafting a legal brief or memorandum, outlining topics or responding to an examination question which requires an analysis of new facts in light of cases studied, students often commit reasoning errors.

A. Reasoning Gaps

There are often “gaps” in reasoning where students fail to include steps crucial to making their arguments. For example, in evaluating a student's response to an examination question, one or more of the following errors may occur: (1) the student fails to state the controlling rule, but does state how the rule applies, and articulates a conclusion;⁹³ (2) the student states the controlling rule,

⁸⁸ *Girouard*, 583 A.2d 718, 719; *Shane*, 590 N.E.2d 272, 273.

⁸⁹ See *Girouard*; *Shane*, 590 N.E.2d at 273.

⁹⁰ *Girouard*, 583 A.2d at 719; *Shane*, 590 N.E.2d at 273-74.

⁹¹ *Girouard*, 583 A.2d at 719; *Shane*, 590 N.E.2d at 273-74.

⁹² *Girouard*, 583 A.2d at 720; *Shane*, 590 N.E.2d at 273.

⁹³ Typically, if the controlling rule is omitted, we are told by the student that he “assumed” the professor knows the applicable rule, and thus, the rule does not bear repeating. While not a wholly invalid assumption, it often happens that a student fails to articulate the controlling rule, it is misapplied – rendering the argument not only incomplete, but wrong.

and the conclusion, but fails to apply the rule, or; (3) the student states the controlling rule and applies it, but fails to articulate a conclusion.⁹⁴ Where these and other reasoning gaps exist, professors make evaluative judgments regarding the soundness, or completeness, of the student's argument.

B. Conclusiveness

Similarly, professors often encounter student responses that are prematurely "conclusive." Not only does the student fail to state the rule of law which is in issue, he will often fail to apply the facts which compel the conclusion. For example, a student may state "X is guilty of murder," or "the elements of causation are not met," without sufficiently demonstrating how she reached the conclusion. Once again, the argument comes across as incomplete or less-thoroughly reasoned.

C. Too Many, Too Few, or the Wrong Facts.

In briefing cases, students may make the error of including too many, or too few facts, which provide the basis for a court's holding. Professors see this most often in the beginning months of a student's law school career, at which time she may still be unfamiliar with (and/or uncomfortable in making) the inferences needed to distill judicial opinions into their essential components. As a result, students will "overbrief" cases. Similarly, especially on examination questions which require students to "spot" issues, professors encounter instances in which students are unable to identify facts relevant to a legal ruling, or those which best compel (or mitigate against) the application of a particular rule.

D. Not Painting the Big Picture

In attempting to synthesize cases, students are often unable to create an accurate "big picture" of a body of legal authority. Concededly, this process is made more difficult because each case may present exceptions, caveats and modifications to the legal principle being examined. Nonetheless, what professors often see is a mere serial discussion of the cases with no sense of their relationship to one another. Moreover, students often miss or ignore the "twists, turns, or bumps" that individual cases create in a body of authority. Such errors demonstrate a failure to communicate an accurate and coherent articulation of legal authority.

Deductive, inductive and analogical reasoning play a critical role in all of the tasks mentioned above formally or informally. These mistakes in students' efforts at briefing cases, written advocacy, creating course outlines, or taking examinations are, arguably, flaws in reasoning. The degree to which the reasoning skills students bring to law school account for these flaws is a question worth exploring, but one for which there is little existing literature. For example, no study has addressed the issue of how students learn to reason within a legal framework. However, the focus of this paper is on what general reasoning skills

⁹⁴ Such argumentation, called an enthymeme, is very common. ALDISERT, *supra* note 11, at 61.

law students from varying backgrounds possess and bring with them to their law school environment.

V. ACADEMIC DISCIPLINE AND GENERAL REASONING ABILITY

The present research study focuses on law students' ability to solve reasoning tasks that involve general deductive logic structures.⁹⁵ Specifically, the research design addresses the question of whether law students coming from certain undergraduate majors perform significantly better on common, everyday scenarios that involve a consistent and specific deductive reasoning structure.

In the psychology literature, two studies investigating separate populations (graduate⁹⁶ and undergraduate⁹⁷ students) have found that students' particular field of study has an impact on performance gains. Depending on the student's field of study, some individuals are competent at solving inductive reasoning problems while others are adept at answering deductive reasoning problems. Specifically, one study found that the ability to solve inductive reasoning problems or deductive reasoning problems significantly differs among law students, medical students, psychology graduate students, and chemistry graduate students.⁹⁸ Another study found that the ability to solve these same problems differs significantly for undergraduate students in the natural sciences, humanities, and social sciences.⁹⁹ Below, the results for each study are reviewed. Then, implications for the present research design's goal of testing whether there are reasoning ability differences among law students based on their undergraduate discipline are discussed.

For this review, the important point is that undergraduate training in reasoning¹⁰⁰ and graduate school training in reasoning¹⁰¹ show that different kinds of training bring about different levels of improvement in deductive reasoning ability.¹⁰² For example, at the undergraduate level it was demonstrated that natural science and humanities students exhibited very large gains in conditional reasoning (deductive logic statements) during their undergraduate training,¹⁰³ yet little (if any) skill gains in methodological and statistical reasoning (regression to the mean, law of large numbers).¹⁰⁴ Lehman and Nisbett concluded that there was a causal connection between the type of major studied in undergraduate education and the level of gains in deductive reasoning ability.¹⁰⁵ Furthermore, at the graduate level, Lehman, Lempert, and Nisbett also showed that students in some

⁹⁵ RULES FOR REASONING (Richard E. Nisbett ed., 1993).

⁹⁶ See Lehman & Nisbett, *supra* note 9.

⁹⁷ See Lehman et al., *supra* note 8.

⁹⁸ See Lehman & Nisbett, *supra* note 9.

⁹⁹ See Lehman, et al., *supra* note 8.

¹⁰⁰ See Lehman & Nisbett, *supra* note 9.

¹⁰¹ See Lehman et al., *supra* note 8.

¹⁰² Patricia W. Cheng et al., *Pragmatic versus Syntactic Approaches to Training Deductive Reasoning*, 18 COGNITIVE PSYCH. 293 (1986).

¹⁰³ See Lehman & Nisbett, *supra* note 9.

¹⁰⁴ See Lehman & Nisbett, *supra* note 9.

¹⁰⁵ See Lehman & Nisbett, *supra* note 9.

areas of training (such as psychology, law, and medicine) exhibited moderate to large gains in conditional reasoning, while others (such as chemistry) did not.¹⁰⁶

In sum, research studies mentioned above show that both undergraduate and graduate education can change the way people reason. In particular, the research suggests that while some fields of undergraduate training significantly improve the ability to employ deductive reasoning, other undergraduate training appears to leave this ability largely unchanged. Of particular interest is the finding that deductive reasoning is also improved by the training associated with law school.¹⁰⁷

While deductive reasoning is not legal reasoning, it is a sub-skill.¹⁰⁸ What is of strategic importance to law school admission offices, professors, and academic support directors is the realization that the improvements in deductive reasoning in law school may be dependent upon a student's undergraduate training. While this is an intuitively appealing notion and one that is implicitly supported in the research literature, it is a hypothesis that has never been directly tested. In short, the undergraduate reasoning and graduate reasoning studies present strong findings. However, neither study makes the connection between training in one domain and the ability to develop one's reasoning skills further in a new setting. In pursuit of this overall question, the following section reports on one experiment that is part of a larger set of investigations currently underway.¹⁰⁹

VI. THE METHODOLOGY: EVALUATING LAW STUDENTS' REASONING SKILLS AND THEIR UNDERGRADUATE MAJOR

It is worthwhile to look more closely at the reasoning skills of law students, given that the results of Lehman, Lempert, and Nisbett are so striking.¹¹⁰ Both natural science and humanities undergraduate students had a disproportionate amount of deductive reasoning gains as opposed to social science and psychology undergraduate majors (given that there were no initial differences among groups).¹¹¹ Lehman, Lempert, and Nisbett found significant results for graduate training in conditional reasoning (law, medicine, and psychology).¹¹² Nevertheless, the research design did not consider prior exposure to deductive training. The current research considers whether currently enrolled law students from natural sciences and humanities backgrounds perform better on general deductive reasoning problems that do law students from social sciences backgrounds.¹¹³

Participants. Currently enrolled law students from two U.S. law schools in the United States participated in this study (School 1 and School 2). Participants either volunteered to complete the materials in a classroom setting at the end of a

¹⁰⁶ See Lehman et al., *supra* note 8.

¹⁰⁷ *Id.*

¹⁰⁸ ALDISERT, *supra* note 11, at 48-49.

¹⁰⁹ Graham and Corter Dissertation work, Columbia Univ. (2001).

¹¹⁰ See Lehman & Nisbett, *supra* note 9.

¹¹¹ See Lehman & Nisbett, *supra* note 9.

¹¹² *Id.*

¹¹³ In a forthcoming research study, Graham and Corter include deductive reasoning problems that are more law-based in context (2001) (research on file with the authors).

lecture (School 1, 53 students), or were recruited (and were paid four dollars) at a table set up in a public space (School 2, 49 students). In both cases, there was a generally quiet and non-distracting environment.

Participants included first-year law students (50 students), second-year law students (35 students), and third-year law students (17 students). All participants completed the experiment's materials¹¹⁴ towards the end of the spring semester, ensuring that first-year students had finished at least one semester of law school.

From the original 140 law student participants, categories were developed based on law students' undergraduate majors. Majors that had six or more individuals per group were compiled. From this information, a reduced group of 102 participants' data was compiled to comprise the final data set. The final groupings of the undergraduate majors of currently enrolled law students included the following: economics (12 students), English/literature (16 students), history (14 students), math/engineering (9 students), philosophy (6 students), and political science (45 students).

Most participants ranged between 23 and 28 years of age, and there were 53 females and 49 males. Participating law students came from a diverse range of undergraduate institutions. Regarding their undergraduate majors, some individuals reported a "double major" (25 students) and others reported a "minor" (32 students). Furthermore, of the students reporting a "double major" there were also a few students reporting a "minor" (7 students).¹¹⁵

Procedure. All participants experienced the experiment in the following way. They first signed a consent form that explained the purpose of the research. Next, they were shown a practice problem to become familiar with the format for the majority of problems they will encounter. This practice problem did not contain the deductive logic structure being tested in this experiment, though it was similar in surface appearance.

After completing the sample problem, a set of instructions was presented and read by each participant. Participants were then given the experimental materials, which consisted of six general deductive reasoning problems similar to those that appeared in Experiment 1 of Cheng and colleagues.¹¹⁶

Participants also completed a demographics questionnaire. This questionnaire asked for the three key variables: (1) undergraduate major, (2) year in law school, and (3) Law School Aptitude Test (LSAT) scores. Based on previous research showing a relationship between deductive reasoning skill and mathematics expertise,¹¹⁷ the number of undergraduate mathematics courses taken was also requested. Other information included in the questionnaire consisted of the

¹¹⁴ Cheng et al., *supra* note 97, at 301. See also Appendix, *infra*, for a specific example.

¹¹⁵ For the coding of undergraduate major, there is no systematic attempt made to deal with the problems associated with "double majors" and "minors," other than to choose the first major that a student writes down. For example, a student could be a double major in Political Science and History. Which one should be coded as their undergraduate major? While subsequent studies such as M. Graham and J. Corter's deal with this issue more thoroughly, it goes beyond the scope of the present analysis.

¹¹⁶ Cheng et al., *supra* note 97, at 301.

¹¹⁷ S.L. Jackson & R.A. Griggs, *Education and the Selection Task*, 26 BULL. PSYCHONOMIC SOC., 327-30 (1988).

following: first-year law school courses taken, first-year law course grades, the extent to which students “liked” their first year courses, law review membership, and intended area of concentration while in law school. All information mentioned above was self-reported by the participants.

Materials. The main section of the experimental materials consisted of six general deductive reasoning problems. All problems were generated from the existing deductive reasoning literature.¹¹⁸ Of the six problems, two were of a “Permission/Obligation” structure, two were structured as “Converse Bias,” and the remaining two were “Arbitrary.” Based on the results of previous research, the “Permission/Obligation” problems are the most “pragmatic” or “everyday,” while the “Arbitrary” problems are the most abstract.¹¹⁹

Before running the experiment on a large scale, a small group of ten law students were interviewed after completing the materials to assess how they perceived the task. While some of the students reported noticing a particular pattern across problems, others did not. Since most students treated each problem individually and carefully, the experiment was then conducted on a larger scale.

Design. The design was a between-subjects correlation study exploring the relationship between two independent variables (undergraduate major and year in law school) and one primary dependent measure (Total General Deductive Reasoning Score).

VII. THE RESULTS: DOES UNDERGRADUATE TRAINING IN REASONING MATTER IN LAW SCHOOL?

All statistical analyses conducted used Analysis of Covariance (ANCOVA).¹²⁰ The total model testing deductive reasoning performance with undergraduate major as the dependent variable plus *LSAT scores* and *school* as covariates was significant.¹²¹ Previous analyses indicated that there were no deductive reasoning performance differences indicated by year in law school (first-, second-, or third-year), yet these results must be taken with caution since there were disproportionately more first-year students in the sample of law students (see previous section). But there were also no significant deductive reasoning performance differences when the combined groups of second- and third-year students (52 students) were compared with first-year students (50 students). In addition, there were no significant differences in deductive reasoning performance by gender or age.

As described in the methods section, thirty-eight participants had to be dropped from the analysis due to insufficient undergraduate major category size within the original sample. In addition, two combinations of majors were made in this analysis. In one category – math/engineering – there were not enough mathematics majors (only 2 students) or applied math majors (only 3 students) or

¹¹⁸ Cheng et al., *supra* note 97, at 301; Lehman et al, *supra* note 9, at 442; Lehman & Nisbett, *supra* note 6 at 960.

¹¹⁹ See Cheng et al., *supra* note 97, at 174-85.

¹²⁰ Readers unfamiliar with statistical analysis may find it more beneficial to read only the first sentence of each paragraph and the Table.

¹²¹ $F(7,94) = 23.933$; $p < .000$; $R\text{-squared} = .641$.

engineering majors (only 4 students) to group separately. But based on the research of Jackson and Griggs¹²² it seemed reasonable enough to group these majors together (as indicated by the high number of mathematics courses each individual had taken). Due to the similarity of undergraduate coursework taken, it was also assumed that English majors and literature majors were enough alike to be combined in a similar fashion. Thus, the final six undergraduate major categories were the following: math/engineering, philosophy, economics, English/literature, history, and political science.

There were marginally significant performance differences in deductive reasoning between School A and School B.¹²³ But since the statistical power of the school covariate was low, it is likely that the variables of school and LSAT overlap.¹²⁴ Thus, deductive reasoning performance differences based on school are dropped in favor of individual differences based on LSAT scores. As expected, deductive reasoning performance differences based on the covariate LSAT scores were significant.¹²⁵ For the independent variable, *undergraduate major*, there were significant deductive reasoning performance differences based on the six majors included in this study.¹²⁶

Since the independent, *undergraduate major* variable is statistically significant, group differences between *Math/Engineering*, *Philosophy*, *Economics*, *English/Literature*, *History*, and *Political Science* can be examined. The reported means are adjusted group means based on the LSAT score distribution. In other words, the analyses first account for individual differences in LSAT scores among the 102 participants that are grouped by undergraduate major. Then, the academic major group averages are adjusted statistically. All analyses are based on this initial adjustment for LSAT score.¹²⁷

Table 1 shows the average deductive reasoning performance score by group, as well as its 95% confidence interval distribution (that is, the long lines). Here, average scores are actually estimated group means. That is, for every analysis conducted, LSAT was entered first and consistently appeared as a significant covariate.

¹²² See Jackson & Griggs, *supra* note 108, at 327-330.

¹²³ $F(1,94) = 3.561$; $p = .062$.

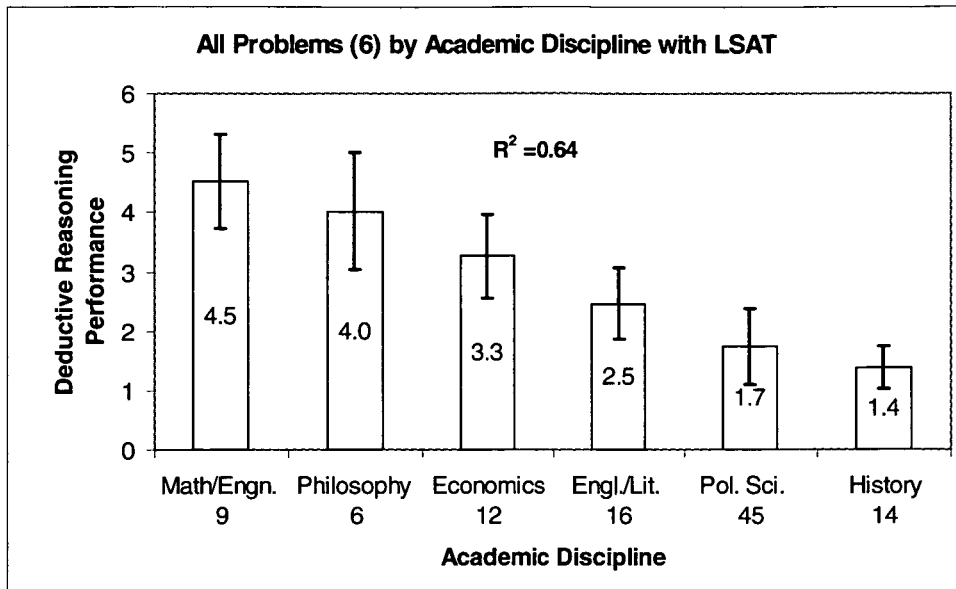
¹²⁴ Participants' average LSAT scores: School A = 168.91 (SD = 4.85); School B = 157.83 (SD = 5.48). All LSAT scores were self-reported by the participants.

¹²⁵ $F(1,94) = 14.200$; $p < .000$.

¹²⁶ $F(5,94) = 13.395$; $p < .000$.

¹²⁷ Adjusted means are based on the covariate *LSAT scores* = 163.16.

Table 1



Out of a total possible score of six deductive reasoning problems, the LSAT score adjusted means were the following: math/engineering = 4.52; philosophy = 4.02; economics = 3.26; English/literature = 2.46; history = 1.28; political science = 1.73.¹²⁸ Math/engineering majors' deductive reasoning performance was significantly different from that of majors in economics, English/literature, history, and political science majors.¹²⁹ Philosophy majors' deductive reasoning performance was significantly different from English/literature, history, and political science majors (although the philosophy group performance should be viewed with caution since there were only six students in total).¹³⁰ English/literature majors' deductive reasoning performance was significantly different from history and political science majors.¹³¹

¹²⁸ 95% confidence intervals for each group are the following: math/engineering = (3.73, 5.32); philosophy = (3.03, 5.01); economics = (2.56, 3.97); English/literature = (1.86, 3.06); history = (.643, 1.92); political science = (1.37, 2.09).

¹²⁹ For math/engineering and economics: mean difference = 1.257; $p = .020$; 95% confidence interval = (.202, 2.313). For math/engineering and English/literature: mean difference = 2.064; $p < .000$; 95% confidence interval = (1.07, 3.06). For math/engineering and history: mean difference = 3.240; $p < .000$; 95% confidence interval = (2.219, 4.2620). For math/engineering and political science: mean difference = 2.80; $p < .000$; 95% confidence interval = (1.91, 3.67).

¹³⁰ For philosophy and English/literature: mean difference = 1.563; $p = .008$; 95% confidence interval = (.410, 2.72). For philosophy and history: mean difference = 2.74; $p < .000$; 95% confidence interval = (1.55, 3.93). For philosophy and political science: mean difference = 2.30; $p < .000$; 95% confidence interval = (1.22, 3.37).

¹³¹ For English/literature and history: mean difference = 1.18; $p = .009$; 95% confidence interval = (.301, 2.05). For English/literature and political science: mean difference = .729; $p = .042$; 95% confidence interval = (.028, 1.43).

VIII. DISCUSSION: INTERPRETATION OF LAW STUDENTS' PERFORMANCE

The results of this research study first indicate that, as expected, LSAT scores are most indicative of performance on general deductive reasoning problems. Yet, once differences in LSAT scores are accounted for (thus, representing – albeit roughly – students' general ability), there are still performance differences in deductive reasoning that are related to the undergraduate major of currently enrolled law students. Thus, these findings are in line with the research literature mentioned previously, suggesting a transfer of training effect based on an individual's academic discipline. While most likely due to differences in the sampling of 1L, 2L and 3L groups, year in law school was not an important factor in students' ability to solve general deductive reasoning problems.

The undergraduate major of law students is related to their performance on general deductive reasoning problems, even after their LSAT scores are considered. Law students with mathematics, engineering, and philosophy majors had, to a statistically significant extent, more correct answers than economics, English/literature, history, and political science majors on these general deductive reasoning tasks. Law students with an economics or English/literature major had, to a statistically significant extent, more correct answers than those who had been history or political science majors during their undergraduate careers. The results are generally compatible with past research on this topic.¹³² Thus, initial results suggest that deductive reasoning skills of law students from certain undergraduate disciplines such as natural sciences or humanities may be systematically higher as compared to those from other disciplines such as the social sciences.

The reported findings make sense from the standpoint of the existing psychology literature on deductive reasoning. In its abstract form, deductive reasoning is a formal logic that most individuals do not intuit without specific experience and training. When constructed in more familiar scenarios, however, deductive reasoning is an intuitive form of the formal logic that “maps on to” or “overlays” the formal one. In other words, individuals can solve the deductive reasoning problems without knowing the formal logic structure so long as they can somehow map their intuitive, everyday logic on to the more formal one built in to the given deductive reasoning problem.

In the experiment, some problems presented to the law students were perhaps most easily solved by means of intuitive, everyday logic that “overlapped” the formal deductive logic structure of the problem. Nevertheless, other problems were more abstract and did not lend themselves to be solved by this intuitive process. It was here that significant differences were found in relationship of deductive reasoning ability to law students' undergraduate academic discipline. More formally, the present study replicates prior research in that despite each deductive reasoning problem having the same underlying logic structure, more individuals were able to solve the pragmatic, everyday problems; fewer individu-

¹³² Lehman & Nisbett, *supra* note 9, at 958 (concurring, except for the economics majors in this sample population, likely due to their math training).

als were able to respond correctly as the nature of the problem became more abstract.¹³³ As previous research has shown, this study also found that individuals' undergraduate discipline had an effect on deductive reasoning ability.¹³⁴ The results confirm the previously cited research showing that background academic discipline training does matter and that it differs by field of study. Thus the present study contributes to longstanding inquiries regarding transfer of training.¹³⁵

Law students' performance varied on deductive reasoning problems, even when controlled for LSAT scores. That is, even when ability differences were accounted for statistically, the undergraduate training of law students was significant. A source of this variation had to do with students' field of study prior to entering law school. Thus, a transfer of training effect in deductive reasoning was found for law students based on their previous academic discipline.

There are significant limitations to the present research findings, however. For example, do reasoning differences by undergraduate discipline persist throughout three years of law school? Alternatively, is it more the case that as individuals progress through three years of law school they become more and more familiar with deductive reasoning? In the present study, students' year in law school was not significantly related to their performance on the deductive reasoning problems. However, previous research¹³⁶ shows a significant gain in deductive reasoning over three years of law school. At present, the sample size of third-year students in this study is likely too small to show performance differences; thus, future research with a larger population of third-year students is required before any conclusions can be drawn.¹³⁷

From the perspective of legal education and law school instruction, the results of this research may confirm some suspicions. That is, even after differences in LSAT scores have been taken into account, law students vary in their ability to comprehend logic structures that are, at minimum, related to legal reasoning. Specifically, legal reasoning requires the skill of deductive reasoning to arrive at logically complete arguments. This research shows that individuals in law school, as previous research has shown with individuals in general,¹³⁸ vary in their ability to work with formal reasoning structures. These differences are accounted for by (a) the nature of their training prior to law school, and (b) the extent to which they can transfer this training into the law school learning environment – a setting which is novel.

IX. CONCLUSION: IMPLICATIONS FOR THE ACADEMIC SUPPORT PROGRAM LAW STUDENT IN 2010

There are ways of productively applying the general trends reported in this research to the law school learning environment. For academic support programs in law schools, the results of this research may help in developing strategies to

¹³³ See Cheng et al., *supra* note 97.

¹³⁴ See Lehman & Nisbett, *supra* note 9, at 959.

¹³⁵ See Cheng et al., *supra* note 97, at 314.

¹³⁶ See Lehman et al., *supra* note 8, at 438.

¹³⁷ See Graham & Corter, dissertation research (2001).

¹³⁸ See Cheng et al., *supra* note 97, at 314.

assess students and promote more focused instruction. Specifically, ASP administrators should note two trends. First, LSAT test scores largely accounted for group differences in deductive reasoning in the present data set, as is to be expected. Second, there were also significant differences based on the students' undergraduate discipline (i.e., their major) and academic training prior to law school. Most notably, these results were not limited to law students with high math ability; rather, humanities students (English and literature majors, specifically) showed strong deductive reasoning skill performance as well.

From this viewpoint, individual differences in learning reasoning skills associated with legal reasoning go beyond law school students LSAT scores and undergraduate grade point average. It may not be a matter of ability as defined by those predictors (reliable as they are). Instead, observed differences in legal reasoning within an ASP context may also be due to law students' training in their undergraduate academic discipline. For example, a history major may or may not reason deductively to the same extent as an engineer although both may be seeking assistance of an academic support program.¹³⁹ In general, the differences found in the study may begin to explain a variety of gaps in legal reasoning, as identified by law faculty and other evaluators of law student learning.

In interpreting this research as members of the law school community involved with educating students, however, it is essential for academic support programs to devise an appropriate framework for evaluating law students' ability to employ various reasoning skills and structures. More specifically, it is inappropriate to oversimplify current law students' cognitive abilities by their major prior to law school, and such practice should be avoided entirely. Rather, these preliminary findings suggest that undergraduate major should be employed as one of several indicators, along with LSAT score, GPA, and comments from legal writing instructors, to assess student needs.¹⁴⁰

X. WHAT CAN ASPs DO TO BETTER ACCOUNT FOR ABILITY AND NEED?

The present study reports that learning certain elements of legal reasoning may not involve the same process for all students in a law class or in an academic support program. When training in legal reasoning is provided within an ASP context, an understanding that the road to learning legal reasoning may not be the same for all students is an insight into how to design effective instruction.

One approach to better account for ability and need is to employ a multifaceted approach to gathering information about a student or group of students, including LSAT scores, undergraduate grade point average, undergraduate major, and a writing assessment from their legal writing instructor. Within this context,

¹³⁹ As a reminder, only average group difference – not individual differences – were tested in this pilot study.

¹⁴⁰ Furthermore, results reported in this research are “average” differences by group: some categories that had “low” averages performed well. For example, some History majors had perfect scores. It is also important to know that some disciplines were not accounted for in this study due to a low number of participants (biology majors, nurses and archeologists). Thus, generalizing to other disciplines beyond what was reported is not advised.

it is also appropriate to administer evaluative questions testing various legal reasoning frameworks such as deductive reasoning. When the various points of data are taken together, a more informed decision about what level of instruction is appropriate can then be made.

For some students who exhibit general deductive reasoning ability, appropriate training may consist of analogies to their prior field of study and a focused reading of carefully selected cases. For example, an engineer who is now a first-year law student with a 3.35 undergraduate grade point average, a 164 LSAT score, and a writing instructor's assessment stating that "while a good student, there are gaps in her arguments" may begin to understand deductive reasoning within a legal reasoning context if the relationship to the "counter-factual" from mathematics is emphasized, since engineers are well trained to consider problems from this perspective. In such cases, perhaps this level of instruction is enough to transfer the previous deductive training of the engineer to the new environment of law school. For many individuals, a few well-chosen examples from case law to accompany the counter-factual comparison may further solidify their understanding of legal reasoning within a deductive reasoning framework.

Nevertheless, other students may need to learn new skills their prior educational background has not provided. These students probably need more intensive instruction and focused effort on their part. It is likely that they will need to progress from easy, everyday examples to progressively more difficult ones. It is also likely that they will need to spend much more time and energy on the easier cases until they are comfortable enough with the thinking structure to move on to more dynamic cases that involve various other considerations.¹⁴¹

In sum, there may be students in ASPs who need differentially focused legal reasoning instruction. Specifically, the present research indicates that considering a law student's undergraduate major when making curriculum or instruction decisions may be one step in a more focused assessment of law students' learning needs. Educators teaching in academic support programs are dedicated to examining ways in which we can improve the success of our students. Helping law students to be more effective in their study, analysis, and communication of their understanding of the law compels us to grow our understanding of where our students are "coming from." By considering our students' undergraduate majors along with other factors, we may be better able to identify and reinforce their legal skills and, in the process, develop methods to ensure their success in the first year of law school and beyond.

¹⁴¹ Due to the preliminary nature of these findings, any recipes for specific instructional strategies for specific groups of students is beyond the scope of this research finding's discussion. A series of research studies, with appropriate designs, is likely to yield a much stronger set of findings from which we can begin to address such instructional approaches.