

BREAKING THE CYCLE: SCIENTIFIC DISCOURSE IN LEGAL EDUCATION

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I. INTRODUCTION

An important part of law's "turning outward"¹ to other disciplines, especially science and social science, is the integration of scientific data into the legal process. Judges have become so receptive to using scientific data in their decision-making process that it has become routine in some types of cases. As a result, both judges and lawyers have to deal with scientific data in litigation and other professional activities much more frequently than they did in the past. In light of the United States Supreme Court mandate in *Daubert v. Merrell Dow Pharmaceuticals*² this trend is certain to continue.

One important issue raised by this development is whether judges and lawyers have the knowledge and skills to handle the various facets of this task competently. This includes knowing when scientific data are useful in resolving legal issues, knowing what sorts of data are useful, knowing how to interpret and evaluate such data and how to draw conclusions from them, and, for lawyers in particular, knowing how to make effective use of scientific data in litigation. The available evidence shows that at present legal professionals typically do not have these skills and knowledge.³

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¹ Martha Minow, *Law Turning Outward*, 73 *TELOS* 79 (1987).

² 509 U.S. 579 (1993).

³ See J. Alexander Tanford, *The Limits of a Scientific Jurisprudence: The Supreme Court and Psychology*, 66 *IND. L.J.* 137, 144-145 (1990) (noting that the Supreme Court has rejected empirical research on jury behavior when deciding trial process cases); Shirley A. Dobbins et al., *Applying Daubert: How Well Do Judges Understand Science and Scientific Method?*, 85 *JUDICATURE* 244, 247 (2002) (suggesting that most judges may be ill-prepared to assess scientific evidence); Shirley A. Dobbins et al., *Asking the Gatekeepers: A National Survey Of Judges On Judging Expert Evidence In A Post-*

The obvious place to search for the root of this problem is law school, where judges and lawyers share a common formal training and socialization.⁴ It is the seminal educational experience in the professional development of all judges and lawyers. Although legal education is complex and entails many components,⁵ casebooks play a central role in this process. Casebooks have been the primary instructional materials in legal education for over a century.⁶ If law students are going to enter the legal profession able to make competent use of scientific data, then casebooks, as the primary instructional materials, need to effectively provide the relevant background. This raises the important question of whether, and to what extent, law school casebooks promote or hinder the development of the knowledge and skills needed to deal with scientific data. Surprisingly, there are no published scientific studies on this critical issue.

This article begins to fill this gap by presenting the first scientific study on how scientific discourse in Supreme Court opinions is treated in law school casebooks. The first part of the article discusses how law is turning outward to other disciplines to carry out its functions and the implications of this development. The second section considers legal education and assesses whether or not it adequately trains its students to succeed in this new interdisciplinary professional environment. Next, this article presents a scientific exploration of law school casebooks. This study focuses on nineteen United States Supreme Court decisions in which scientific data was pertinent to the Court's decision. Using quantitative content analysis, this study compares these cases to the edited versions of the opinions that appeared in available editions of leading constitutional law casebooks, as well as casebooks in other subjects. The analysis showed that over the last several decades editors have systematically deleted the discussions of scientific data. This pattern has not changed, even as courts' use of such data has become more frequent.⁷ After the findings of the study are presented and discussed, the article concludes by considering the study's implications and the direction of future research.

II. THE CHANGING NATURE OF LAW

Multiple theoretical trends reflect that a growing interaction between law and science is occurring.⁸ One scholar has identified these trends as an indication that

Daubert *World*, 25 LAW & HUM. BEHAV. 433 (2001) (providing a national survey of 400 state trial court judges which indicated that most judges neither understood nor applied the technical *Daubert* guidelines for determining the admissibility of scientific evidence).

⁴ See Bethany R. Henderson, *Asking the Lost Question: What is the Purpose of Law School?*, 53 J. LEGAL EDUC. 48 (2003). See also *infra* note 19 and accompanying text.

⁵ See generally Section of Legal Educ. & Admissions to the Bar, Am. Bar Ass'n, *Legal Education and Professional Development: An Educational Continuum*, 135 (1992) [hereinafter *McCrate Report*], available at <http://www.abanet.org/legaled/publications/onlinepubs/maccrate.html>.

⁶ See generally, LAWRENCE M. FRIEDMAN, *A HISTORY OF AMERICAN LAW* 612-14, 631-32 (Simon & Schuster)(1985) (recounting the introduction of the casebook as the primary text for law schools); GRANT GILMORE, *THE AGES OF AMERICAN LAW* (Yale Univ. Press 1977) (noting that the casebook approach to legal education has long remained in fashion).

⁷ See ROSEMARY J. ERICKSON & RITA J. SIMON, *THE USE OF SOCIAL SCIENCE DATA IN SUPREME COURT DECISIONS* 12-18 (Univ. of Illinois Press 1998) (recounting the history of social science in the courtroom).

⁸ Minow, *supra* note 1, at 79.

law is turning outward to other disciplines' paradigms.⁹ Legal professionals are also increasing their use of nonlegal methodologies to examine legal phenomena.¹⁰ In fact, legal scholars make so much use of nonlegal methodologies that it has spawned some controversial attempts at dialogue between legal and scientific scholars.¹¹

In some areas of law, judges are finding themselves more routinely using social science data to resolve legal disputes.¹² In fact, David Faigman suggests that it is the exceptional criminal or civil trial that does *not* involve experts claiming that some scientific foundation forms the basis for their testimony.¹³ He argues that the prevalence of science in law can be discerned by merely perusing television and newspapers.¹⁴ He illustrates this permeation in a useful way by contending that there exist four legal and political decision-making contexts in which science can enter: (a) trial and appellate courts in nonconstitutional cases; (b) constitutional cases, and especially Supreme Court decisions; (c) legislatures; and (d) administrative agencies.¹⁵

Despite its apparently widespread use in the law, there are many impediments preventing science from coordinating well with the legal field. These include: "(a) the availability of data; (b) the layperson's understanding of the science; (c) integrating science into other information; and (d) cultural conflicts between law and science."¹⁶ The law uses facts about the world, and science is a method for discovering facts, so there should be no doubt as to the value of familiarizing legal professionals with scientific discourse. Even though judges and lawyers need not understand science as deeply as scientists do, they still need to understand the basic principles and methodologies of science in order to make informed decisions about its use.

Nevertheless, current research indicates that judges generally feel poorly prepared to perform the evidentiary gate-keeping function that the Supreme Court delegated to them in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* (namely, that courts are expected to act as gatekeepers who use reasoned guidelines to determine which scientific evidence can come in).¹⁷ That judges feel poorly prepared for this task necessitates exploration into the exposure they get as law students to scientific discourse. This study is designed to begin that exploration through the examination of law school's primary pedagogical tool: casebooks.

III. LEGAL EDUCATION

A search of the current social science literature uncovers no studies of legal

⁹ *Id.*

¹⁰ Lee Epstein & Gary King, *Exchange: Scientific Research and the Goals of Legal Scholarship: The Rules of Inference*, 69 U. CHI. L. REV. 1, 6 (2002).

¹¹ The present study's authors acknowledge that not all who attend law school become lawyers (litigating or otherwise) and judges, or work in the law field. However, for the purposes of convenience, the term "lawyer" or "legal practitioner" will refer to anyone who has attended law school and works in some capacity thereafter which calls upon her law school training.

¹² Minow, *supra* note 1, at 79.

¹³ DAVID FAIGMAN, *LEGAL ALCHEMY*, x (W.H. Freeman & Co. 2000).

¹⁴ *See id.* (referencing highly publicized cases).

¹⁵ *Id.* at 50.

¹⁶ *Id.* at 51.

¹⁷ *Id.* at 60-64.

education relevant to scientific discourse as presented in casebooks. There is some informative anecdotal literature in law journals about casebook usage, but not how it relates to scientific discourse.¹⁸ While the preference would have been to review relevant scientific literature, the fact that there is none to review further supports the notion that research such as the present study is necessary and valuable. Therefore, the remainder of this section will address the anecdotal literature with the hope of acquiring some useful insight into the matter of legal education and how scientific discourse factors in.

Legal education stands apart from many other graduate-level educational disciplines.¹⁹ This is partly due to the fact that, of all university graduate-level programs in the natural and social sciences, law is the only program that generally does not require basic instruction in statistics and quantitative methodology.²⁰ Furthermore, law school's instructional paradigm has remained largely unchanged over the last century despite the major movement in most other academic disciplines to more quantitative analysis.²¹ The study of law has remained insular; however, there is some evidence that the legal field, particularly its scholarship, is beginning to 'turn outward' to other disciplines for assistance or input when performing law-related tasks.²²

One of the most pervasive obstacles to the effective use of science in law is the fact that legally-trained professionals who encounter science in their work have little or no training in science and, in fact, may have an aversion to it.²³ This means that although they are regular consumers of science, most legal professionals do not understand what they consume, or how to consume it. To put this into a historical perspective, some of America's earliest political leaders such as James Madison, George Washington, John Adams, James Monroe and Thomas Jefferson all had extensive scientific or engineering training.²⁴ This is an interesting departure from modern times where less than one percent of the current 535 United States Congressmen have any substantial scientific training.²⁵

Currently, law students and practitioners levy bountiful and sharp criticisms toward law schools. Law school critics argue that since law professors are completely enveloped in the academic aspects of law, they teach law only as an academic subject that is to be examined thoughtfully from afar instead of with a more intimate practitioner point-of-view.²⁶ Since scientific methodologies and discourse are an important part of what lawyers *do* in practice, rather than how they *think* about the law, instruction in scientific discourse is naturally omitted. Exacerbating the problem is the fact that law professors typically have no foundation

¹⁸ Henderson, *supra* note 4 at 66-67.

¹⁹ Steven B. Dow, *There's Madness in the Method: A Commentary on Law, Statistics, and the Nature of Legal Education*, 57 OKLA. L. REV. 579 (2004).

²⁰ *Id.*

²¹ *Id.*

²² *Id.* at 595; Minow, *supra* note 1, at 100; NICHOLAS MERCURO & STEVEN G. MEDEMA, *ECONOMICS AND THE LAW: FROM POSNER TO POST-MODERNISM* 7 (Princeton Univ. Press 1997).

²³ FAIGMAN, *supra* note 13, at xi.

²⁴ *Id.* at 123.

²⁵ *Id.*

²⁶ Henderson, *supra* note 4, at 50 (discussing law school critics).

in educational and learning theory.²⁷ If law professors were afforded this type of training, they would discover that the incorporation of more practice-related instruction and tools would be a major benefit to their students. Such practice-oriented instruction would undoubtedly need to include scientific discourse due to the fact that judges and lawyers are increasingly encountering it in their practices and courtrooms.

IV. SCIENCE TRAINING IN LAW SCHOOL

The purpose of law school is to teach law students to *think* like lawyers.²⁸ However, *thinking* is not the only function of a lawyer; *practicing* (or *doing*) is as well. Teaching law students how to *practice* like a lawyer is not emphasized in standard law classes.²⁹ Other than an occasional mock-trial or “moot court” experience, most law schools typically do not require an organized set of activities designed to build practice skills.³⁰ To be fair, legal research and writing courses involve *research* and *writing*, which are practice skills; however, they do not typically involve many interactive tasks such as advocacy, oral argument, and witness preparation. Of course, there are law clinics where students are provided with real-life courtroom experiences in which they are responsible for representing a client’s interests. However, these clinics, while offered, are typically not required, just as courses in trial advocacy or litigation are not typically required³¹. Practice skills courses (including clinics) could provide law students with this exposure to scientific discourse, but this approach would only work if these types of courses were required.³²

To be more specific, three skills are central to the actual functions of a lawyer: 1) legal reasoning capacity; 2) judgment capacity; and 3) communication capacity.³³ Instruction in scientific methodology or discourse clearly does not assist students in developing their legal reasoning capacity, but such specialized instruction should help to develop judgment and communication capacity.

Judgment capacity is “the ability to exercise sound and reasoned judgment in light of an ‘integrated understanding’ of the complex factual patterns, conflicting interests, potentially applicable legal theories, and pragmatic considerations involved in any given legal issue.”³⁴ As an example, a lawyer can make better judgments about a particular scientific expert witness’s qualifications and abilities if he or she better understands the language the witness is using and the culture in which the witness exists. The same can be said for a lawyer’s ability to judge the probative value of evidence such as a scientific report or journal article. Because science

²⁷ See generally Douglas J. Whaley, Teaching Law: Advice for the New Professor, 43 OHIO STATE L.J. 125 (1982).

²⁸ *Id.* at 52.

²⁹ Henderson, *supra* note 4 at 63.

³⁰ Corbin, A.M., *Think as I Say, Not Do as I Do: A Survey of Practice Coursework for Law Students*. (2006). Unpublished empirical study revealing that only about one-third of law schools require law students to take a scientific discourse type course to graduate. Preliminary results with author.

³¹ *Id.*

³² *Id.*

³³ Henderson, *supra* note 4, at 62.

³⁴ *Id.* at 60.

informs the world about facts, lawyers need to be able to understand how science can help or hurt their cases based on the conclusions that are supported by the relevant evidence. Additionally, the pragmatic or public policy considerations attached to any legal issue may also be informed or affected by scientific study. An understanding of these considerations could easily impact how attorneys use judgment capacity to develop their cases.³⁵

Instruction in scientific methodology and discourse would undoubtedly enhance development of law students' communication capacity. Communication capacity has been defined as "the ability to communicate effectively with a wide variety of audiences for a wide variety of purposes."³⁶ Communication capacity is an especially important skill considering the potential for expert scientific testimony to make a difference in lawyers' cases. Lawyers must communicate with scientific experts regarding their work, thoughts, theories and practices in order to effectively use this information for the benefit of their clients' cases. The lawyer must also be proficient at communicating scientific information to opposing counsel and, in a trial situation, to a judge and perhaps a jury. Most importantly, the lawyer must be capable of understanding the scientific expert's language and culture in order to effectively communicate how this information helps, or does not help, her case.

In 1984 the Journal of Legal Education published an article that emphasized the importance of incorporating science into a legal education by addressing the value of teaching statistics to law students.³⁷ However, it is important to note the difference between science and statistics. Science is a set of paradigms with particular methodologies designed to answer questions in a particular way. Statistics is merely a tool used in only some of those methodologies (namely, the quantitative ones) to analyze data collected in an effort to answer the questions asked. Statistics is far from a synonym for science, but it is one of the most critical tools of scientific methodology. This article noted that a subcommittee of the American Statistical Association identified statistical training for law students as "important to the legal system: scientific and statistical evidence prepared for specific proceedings; program evaluation; psychological, sociological and economic studies; public health and epidemiologic data and studies; social and economic data."³⁸

V. IT IS BROKEN AND NEEDS TO BE FIXED

Even though there is little scientific study of law school practices, anecdotal and impressionistic evidence indicates that law schools do not adequately prepare law students for the practice of law.³⁹ More to the point, one scholar has stated that "[i]t is plain that many of law schools' current practices not only fail to support but in fact

³⁵ Even though the current study's authors use a case as an example of a situation where a legal professional would encounter science, we emphasize that the importance of understanding science applies equally to other practice-related activities in the law.

³⁶ Henderson, *supra* note 4, at 61.

³⁷ David H. Kay, *Thinking Like a Statistician: The Report of the American Statistical Association Committee on Training in Statistics in Selected Professions*, 34 J. LEGAL EDUC. 97 (1984).

³⁸ *Id.* at 98 (describing "scientific and statistical evidence prepared for specific proceedings; program evaluation; psychological, sociological and economic studies; public health and epidemiologic data and studies; social and economic data" as important to the legal system).

³⁹ See, e.g., Henderson, *supra* note 4.

actually undermine law school's current purpose."⁴⁰

The problem is thought to lie in both pedagogy and curriculum; a central aspect of curriculum is where the present study comes into play. It has been suggested that law students cannot be expected to learn how to think like lawyers just by reading a casebook or listening to a lecture about lawyering skills. Students must be active in wrestling with identification and evaluation of complex legal problems. They also need hands-on practice in communicating to many different audiences, and they must get comprehensive feedback on their efforts. In order to solve complex legal problems and communicate effectively with different audiences, law students must have a basis in the language spoken by those involved in establishing the facts that comprise the foundation of a legal argument. This includes being familiar with scientific discourse.

Even the American Bar Association, in its *McCrate Report*, criticizes legal education for the fact that so few law students receive adequate training for the breadth of practical skills required in the legal profession.⁴¹ The Report goes on to identify certain elements that are fundamental lawyering skills, which include: problem solving, legal analysis and reasoning, legal research, factual investigation, and counseling.⁴² Clearly factual investigation involves the need to understand science.

Law students must also understand the context in which legal issues exist before being sent out into the world to practice law. Critics claim that not only does legal education disregard the importance of the context in which law exists, but it also seems to devalue the need to understand it.⁴³ Considering the prevalence of science in the legal world, that context naturally involves scientific discourse and methodology, neither of which can be understood by a legal practitioner who receives no instruction and only limited exposure to the subject in law school. Although it may be unrealistic to expect law schools to change overnight, increased exposure to scientific discourse can be easily accomplished by an important aspect of legal education: casebooks.

One would find it very difficult to argue that books do not play a crucial role in professional education. In fact, books and journals are still the principal method of knowledge transmission, despite phenomenal advances in communication technology.⁴⁴ Casebooks are the primary instructional materials used in legal education.⁴⁵ Casebooks typically are typically compilations of leading cases selected and edited by legal scholars to address relevant subject matter. These editors typically include annotations with brief histories, reactions to and questions about the included cases. Sometimes cases include directly quoted text from the originally published opinion, what will hereafter be referred to as "opinion form." In other circumstances, the cases are briefly addressed either as part of an annotation, or in a footnote.

⁴⁰ *Id.* at 71.

⁴¹ *McCrate Report*, *supra* note 5, at 135.

⁴² *Id.*

⁴³ Henderson, *supra* note 4, at 66-67.

⁴⁴ ELP, the Working Group of European Librarians and Publishers, *Barriers to the Flow of Books*, 16 J. INFO. SCI. 275 (1990).

⁴⁵ Henderson, *supra* note 4, at 64-66.

Editors cannot realistically include every case on a topic, nor can they include every word in the cases they do include. While editors have to make difficult choices about what to include, this allows them to highlight the important aspects of the cases and provides them with room to incorporate annotations and questions for students to consider. For example, editors may determine that shortening a case in opinion form is worthwhile if it provides room for another case they deem sufficiently pertinent for inclusion. Therefore, they may edit out portions of cases, perhaps portions including scientific discourse, they deem less important than the portions they leave in. To be sure, sometimes editorial decisions have more to do with logistical space concerns than case coverage concerns. Regardless of why scientific discourse may be edited out proportionately more than non-scientific opinion text, these authors argue there are important implications to the resulting loss of exposure by law students.

It is very difficult to determine why editors make the choices they make because no studies in the scientific literature can be found addressing the matter. Such determination should be a matter for future research. This study supplies a critical foundation for such future research because it is the first study to determine whether casebook editors exclude scientific discourse disproportionately in relation to other material in the originally published opinion. Before detailing how this study accomplishes such a foundation, a brief history on casebook usage in law schools is necessary.

Casebook usage in law schools has been dubbed the “case method.” Its use was popularized at Harvard Law School in the late 1800’s.⁴⁶ Christopher Columbus Langdell, the founder of case method, sought to establish law as a scientific endeavor that mirrored the success and growth he had seen the natural sciences experience earlier that century.⁴⁷ Langdell’s idea of the scientific method applied to law; however, may differ from what a scientist’s perception might have been, or would be today. This can be seen from a description of the case method:

[S]tudents read judicial decisions, usually appellate ones, and the teacher questions them about the facts, principles, and theories behind those decisions The goal is to teach students how to analyze a case in order to ascertain the doctrinal and theoretical justifications for its holding, and thus to comprehend the case’s precedential value and its applicability to different fact patterns. The case method is quite successful at doing that, but it does not offer students the historical and contextual grounding lawyers require, nor does it engage students in practicing skills other than analyzing and reasoning from cases.⁴⁸

The case method does not use a systematic, randomized examination of cases.⁴⁹ Because randomization and systematic examination (real world observation) are essential tenets to scientific method, the case method is thus precluded from being classified as a scientific endeavor.

Nevertheless, case method “reigns supreme in spite of suffering nearly constant

⁴⁶ *Id.* at 64; *see also* Dow, *supra* note 19, at 582.

⁴⁷ Dow, *supra* note 19, at 580-81.

⁴⁸ Henderson, *supra* note 4, at 64-65.

⁴⁹ *See* Dow, *supra* note 19, at 583.

criticism since its inception and in spite of ‘the fact that Langdell’s justification for developing and using [it]—his belief that law is a science that can be reduced to fundamental rules through scientific analysis—has long since been repudiated.’⁵⁰ The case method has persevered despite the great gap in its theoretical foundation. One legal scholar identified the following reasons for the perseverance of the case method: (a) the role it plays in the profession’s distinguished status; and (b) the convenience and efficiency with which the method is maintained.⁵¹ Therefore, if law schools insist on retaining the casebook methodology and its pedagogical traditions, casebooks should be scientifically analyzed in order to determine if law’s turning outward trend, described in above, is being implemented in case books.

VI. A SCIENTIFIC EXPLORATION INTO CASEBOOK EDITING

A. Study Design

Casebooks were examined using content analysis, which is a research tool designed to “determine the presence of certain words or concepts within texts or sets of texts.”⁵² Researchers using this tool typically “quantify and analyze the presence, meanings and relationships of such words and concepts, then make inferences about the messages within the texts, the writer(s), the audience, and even the culture and time of which these are a part.”⁵³ Content analysis was already a widely used research tool in the 1940’s despite its unwieldy nature, and it is still used today.⁵⁴ Even though performing word counts (i.e., examining texts for the frequency of target terms) is not the most sophisticated method of analysis, it is still a valuable one that can be informative and is quite suitable for the present study’s purposes. One recognized use of content analysis is to “[i]dentify the intentions, focus or communication trends of an individual, group or institution.”⁵⁵ It is for this very purpose that the present study is designed.

Furthermore, Klaus Krippendorf, a highly regarded scholar in content analysis, notes, “[s]ince most social processes are transacted through symbols, the widest use of content analysis is found in the social sciences and humanities.”⁵⁶ Semantical Content Analysis is described by Irving Janis as “procedures which classify signs according to their meanings (e.g., counting the number of times that Germany is referred to, irrespective of the particular words that may be used to make the reference).”⁵⁷ However, Janis goes on to specify that in reference to Semantical Content Analysis, “designations analysis - provides the frequency with which certain objects (persons, things, groups or concepts) are referred to, that is roughly speaking

⁵⁰ Henderson, *supra* note 4, at 72 (quoting Russell L. Weaver, *Langdell’s Legacy: Living with the Case Method*, 36 VILL. L. REV. 517, 545 (1991)).

⁵¹ *See id.* at 72-73.

⁵² Colo. State Univ., Writing Guides: Content Analysis, <http://writing.colostate.edu/guides/research/content/printformat.cfm?printformat=yes> (last visited Oct. 13, 2007).

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ KLAUS KRIPPENDORF, CONTENT ANALYSIS: AN INTRODUCTION TO ITS METHODOLOGY 33 (Sage Publications 1980).

⁵⁷ Irving Lester Janis, *The Problem of Validating Content Analysis*, in LANGUAGE OF POLITICS: STUDIES IN QUANTITATIVE SEMANTICS (Harold Dwight Lasswell, et al., eds., 1965).

subject matter analysis (e.g., references to German foreign policy).”⁵⁸ It is under this “designations analysis” that the content analysis used in this study most appropriately fits.

As indicated in Section V above, the case method involves casebooks that are predominantly lengthy excerpts from leading United States Supreme Court cases. Given the notion that science has increasingly become a part of the legal world, judges can be expected to address scientific concepts and/or discourse in their opinions. Thus, legal cases will likely contain scientific discourse to some extent. In order to determine if law schools are turning outward to other disciplines, particularly to scientific disciplines, one would do well to look for this trend in casebooks, the primary pedagogical tool used in legal education.⁵⁹ It follows that if editors are picking up on this trend, casebooks will reflect a parallel trend in the amount of scientific discourse in the included opinions. If the cases editors include in opinion form have less scientific discourse than the officially reported opinions, one could argue that casebook editors are either not following this trend, or do not view scientific discourse to be as pertinent as the nonscientific parts of the case.

The purpose of this study is to examine the prevalence of scientific discourse in law school casebooks, the single most prevalent type of text used to teach law students. On the one hand, because law schools are typically traditional institutions and law schools are the primary consumers of casebooks, one might expect there to be no indication of the turning outward trend in casebooks (i.e., nonparallel, or even less, inclusion of scientific discourse in casebook treatment of a case in opinion form). On the other hand, these casebooks are arguably edited to conform to the needs of law schools, so one might expect that editors have caught wind of the turning outward trend and are ensuring the cases they include in their casebooks maintain the same percentage of scientific discourse as can be found in the officially reported opinions. As we suggest in the Conclusion, there is some indication that law schools are acknowledging the turning outward trend by offering more elective courses that involve scientific discourse.⁶⁰ Therefore, one might find that cases contained in later editions of casebooks may contain more scientific discourse (more parallel with the officially reported opinion) than they did in earlier editions of the same casebook series. Finally, there are two working hypotheses guiding this study. The first is that casebook edition opinions overall will tend to contain a smaller percentage of scientific discourse than do the official versions published in the United States Reports. The second working hypothesis is that later casebook editions will tend to include larger percentages of scientific discourse in an opinion than do earlier editions containing the same opinion.

B. Methodology

Materials used for this study included published United States Supreme Court case opinions and published editions of law school casebooks. Fourteen United States Supreme Court cases identified by Erickson and Simon⁶¹ as involving

⁵⁸ *Id.*

⁵⁹ Henderson, *supra* note 4, at 54.

⁶⁰ See *infra* text accompanying notes 133-134.

⁶¹ ERICKSON & SIMON, *supra* note 7, at 2-3.

scientific evidence at some level comprised the units of analysis for this study. Five more leading cases were identified by the authors as heavily involving scientific evidence and/or statistics and as typically covered in law school curriculum, for a total of nineteen cases.⁶²

Those cases that were unlike *Daubert*,⁶³ in that they did not involve scientific evidence as the central issue, were chosen because they involved a constitutional issue. Defining the search with “constitutional issues” was critical to ensuring that the leading cases chosen would have a higher likelihood of being included in a constitutional law casebook and therefore read by law students. This was an important decision given that a course in constitutional law is typically required curriculum for law students. Even though the American Bar Association (ABA) requires that law schools teach general areas of law and does not specify which courses must be taught, a course in constitutional law is typically required of law students attending ABA-accredited law schools.⁶⁴

Neither casebook subjects nor casebooks within a subject could be randomly selected to make sure that there were sufficient cases with scientific discourse to analyze meaningfully. Therefore, the focus of the data search was on constitutional law casebooks. Evidence and sex-based discrimination casebooks were also examined. The underlying rationale for including evidence casebooks was that even though evidence is typically not required, it may be a likely elective for law students because it is tested on the Multistate Bar Exam (MBE).⁶⁵ Because it is on the MBE, it is typically also on most state essay bar exams.⁶⁶ Sex-based discrimination was chosen as a comparison because Simon and Erickson’s focus on the scientific evidence used in these kinds of cases implies that they may involve more scientific

⁶² *Frye* was an important case whereby the United States Supreme Court established the peer acceptance test for scientific testimony. This case was not included because it was rarely seen in any of the casebooks and a more recent case, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), essentially overruled it. See Table 1 for full case names, year of decision and citation.

⁶³ 509 U.S. 579 (1993).

⁶⁴ An examination of the websites of ten law schools randomly selected from the top 100 ranked law schools indicated that constitutional law is invariably required curriculum for law students in the sampled institutions. See Univ. of Va. Sch. of Law, General Curriculum, <http://www.law.virginia.edu/html/academics/curriculum.htm#courses> (last visited Oct. 13, 2007); Univ. of Tex. at Austin Sch. of Law, Admissions-Curriculum, <http://www.utexas.edu/law/depts/admissions/about/curriculum.html> (last visited Oct. 13, 2007); Washington and Lee Univ. Sch. of Law, About the J.D. Program at W&L, <http://law2.wlu.edu/admissions/page.asp?pageid=311> (last visited Oct. 13, 2007); Notre Dame Law Sch. Admissions, Curriculum, http://law.nd.edu/prospective_students/academics/curriculum.html (last visited Oct. 13, 2007); Univ. of Florida Fredric G. Levin Coll. of Law, Academics, <http://www.law.ufl.edu/programs/jd/selection.shtml> (last visited Oct. 13, 2007); Univ. of Colo. at Boulder Sch. of Law, The First-Year Curriculum, http://www.colorado.edu/law/academics/1_yr_curriculum.htm (last visited Oct. 13, 2007); Chicago-Kent Coll. of Law, Course Descriptions, <http://www.kentlaw.edu/academics/courses.html#required> (last visited Oct. 13, 2007); Loyola Univ. Chi. Sch. of Law, Curriculum Guidelines, <http://www.luc.edu/law/academics/guidelines.html> (last visited Oct. 13, 2007); Univ. of Louisville Louis D. Brandeis Sch. of Law, Requirements, <http://www.law.louisville.edu/academics/second-third-year-j-d-program/requirements> (last visited Oct. 13, 2007); The Catholic Univ. of Am. Columbus Sch. of Law, Courses of Instruction, <http://law.cua.edu/academic/course%20descriptions.pdf> (last visited Oct. 13, 2007).

⁶⁵ See Corbin, *supra* note 30. See also *infra* note 59.

⁶⁶ See American Bar Association, Bar Admissions and Comprehensive Guide, <http://www.abanet.org/legaled/baradmissions/basicoverview.html> (last visited Oct. 13, 2007); Barbri Bar Review, Arizona Bar Exam Review, <http://www.barbri.com/states/az/index.htm> (last visited Oct. 13, 2007); Barbri Bar Review, Michigan Bar Exam Review, <http://www.barbri.com/states/mi/index.htm> (last visited Oct. 13, 2007).

evidence than many other types of cases.⁶⁷

The casebooks themselves were chosen for a variety of reasons. To begin with, the law library used for the casebook search is ranked fourth in the nation of law school libraries by the National Jurist magazine.⁶⁸ It has a collection development policy of buying textbooks that are intended for student use.⁶⁹ In fact, the University of Michigan Law Library's relevant policy states, "[w]e do not buy textbooks, except those intended for law schools, or of significant use to our students. We buy all 'hornbooks' and nutshells. We buy selected casebooks; e.g., those being used in a law class, or classic works."⁷⁰ The casebooks were also chosen specifically because they have multiple editions thereby allowing us to identify the trends targeted for analysis in this study. No scientific work exploring how widely used these casebooks are in law school courses can be found in the current social science literature. Therefore, we cannot make any assertions about the representative nature of the casebooks we used for this study. However, one could argue that the leading cases for law school subjects, particularly the more standard subjects like constitutional law and evidence, are going to be included in a casebook regardless of the editors. It would not make sense for editors to leave out leading cases (the cases we focused on in this study) if they want their casebooks published. In fact, of the fifteen cases included generally by the constitutional law casebooks that we studied (the other four cases were more sex discrimination or evidence cases and were completely excluded from all the constitutional law casebooks we examined), eleven (73 percent) were included in every single casebook set. Only four cases were completely excluded by any one casebook set even though they were included in the other casebook sets. This means that the included cases had a better than random chance of being included in a casebook set, which implies that a variety of different editors are purposely including those particular cases in their casebooks.

C. Procedure

The goal in analyzing the cases was to look for scientific language and quantify it. Scientific language was included from disciplines like medicine, psychology, chemistry, and statistics. In order to establish percentages of scientific discourse in an officially reported opinion, "line counts" were derived. In order to determine which lines to count, all lines of a complete sentence were included (even if the entire sentence was not made up entirely of scientific discourse terms). If the words comprised at least half a line, it was counted as one line. Lines were counted only in the majority opinion unless no mention of scientific evidence was made there. In that case, lines were counted in the concurring or dissenting opinions. In determining the total number of lines in a court's opinion, counting began where the majority opinion commenced and stopped at "it is so ordered" or similar language. Generally, neither nonmajority opinions nor footnotes were counted in the total

⁶⁷ ERICKSON & SIMON, *supra* note 7, at 92-134.

⁶⁸ Univ. of Mich. Law Sch., News and Information, <http://www.law.umich.edu/newsandinfo/oct2004.htm#> (last visited Oct. 13, 2007).

⁶⁹ Telephone interview with Barbara Garavaglia, Head of Reference at Univ. of Mich. Sch. of Law Library (June 12, 2006).

⁷⁰ Univ. of Mich. Law Library Collection Dev. Policy, 22 (June 15, 2007) (unpublished policy, on file with the Univ. of Mich. Law Library).

number of lines. However, footnotes were identified in the final tables merely as “footnote” without line counts, if there was no scientific discourse text in the majority opinion. Footnotes were handled this way because they were so sporadic.

An important note to make here concerns the font size of the print in these casebooks. For the most part, these casebooks share the same publisher which one may assume maintains some standard for font size. This nevertheless poses a limitation that will be addressed in the appropriate section.

For the purposes of this study, “scientific discourse” only included information that was linked to scientific publication or research and so identified by the Court. Information offered by the Court as its own, without citing a scientific source was not counted. Instead, only information that was linked to scientific publication or research and so identified by the court was counted. Additionally, the authors did not count the court’s own comments regarding testing and measurement when it did not refer to testimony, experts, or authority.⁷¹

Key terms in scientific discourse were identified in order to establish a standard by which to determine whether or not a line should be counted as a scientific line. Lines containing one or more of these key words were counted as scientific only if the word was used in the context of scientific research, statistics, data, or publication.

The following terms were used:

expert	testimony	study
evidence	authority	research
science	scientific	data
variables	actuarial	judgment
findings	report	measuring
medical	opinion	percent (%) ⁷²
measure	prediction	predict

The following ambiguous references were included:

1. Reference to an expert even when discussing a procedural issue;
2. Reference to scientific discourse without necessarily going into detail on it;⁷³
3. Accompanying editors’ comments that were embedded within the case quotes and included in total and scientific discourse line counts.

The following ambiguous references were not included:

1. Presidential task forces;⁷⁴
2. Medical standards as gleaned from a journal, such as an ethics journal;⁷⁵

⁷¹ The Court’s own comments about science are relevant but beyond the scope of the present study. These comments, however, are quite appropriate for future research on the Court’s own musings on or impressions of science.

⁷² The “%” symbol, while not a word, was counted as one due to its universal usage as a substitute for “percentage” or “percent”.

⁷³ *See, e.g., McCleskey v. Kemp*, 481 U.S. 279, 286 (1987) (referring to the Baldus study).

⁷⁴ *See, e.g., Frontiero v. Richardson*, 411 U.S. 677, 685-6, n.15 (1973) (discussing a presidential task force on women’s rights).

⁷⁵ *See, e.g., Roe v. Wade*, 410 U.S. 113, 144 (1973) (referencing an American Medical Association (AMA) Judicial Council opinion).

3. Congressional or senate reports;⁷⁶
4. Professional guidelines;⁷⁷
5. A percentage if used as a standard and not linked to statistical calculations;⁷⁸
6. Law review articles even if the article indicated it was somehow related to science or empiricism;
7. Judges' testimony does not qualify as expert testimony;⁷⁹
8. Editors' questions.

Line counts were performed primarily on cases in opinion form. More specifically, if the amount of quoted opinion text was larger than the editor's annotation, the case treatment was deemed in *opinion form*. Another indicator that the case was in opinion form was if the title was in all capital letters. Line counts performed for cases in note form (i.e., only mentioned in the editors' annotations or in a footnote) so rarely produced usable material that they were excluded from the total count.

VII. STUDY FINDINGS

A. General

Calculation of percentages for the originally published versions of the court opinions showed that most cases did not contain much scientific discourse, but there were a few exceptions.⁸⁰ In fact, two cases contained no scientific discourse in the majority opinion but were chosen for other reasons. *Guerra*⁸¹ was chosen because the Court indirectly addressed scientific research when it discussed the legislative intent of the statute at issue and *Bowers*⁸² was chosen because a key footnote in the dissent addressed scientific research. As shown in column D of Table 2, the overall percentages were determined by dividing the number of lines identified as "science lines" by the total number of lines in the majority opinion. For example, in *Muller v. Oregon*,⁸³ the total number of lines in the majority opinion is 206, and the number of science lines is 15 making the percentage of science lines in *Muller* 7.3 percent.

The overall results of the study support our hypothesis. Examination of the first edition and all subsequent editions, showed the opinions included smaller percentages of scientific discourse than the official opinions appearing in the United

⁷⁶ See, e.g., *Cal. Fed. Sav. & Loan v. Guerra*, 479 U.S. 272, 286, n.18 (1987) (referencing a congressional report); *L.A. Water Dep't v. Manhart*, 435 U.S. 702, 717, n.32 (1978) (referencing a congressional report).

⁷⁷ See, e.g., *Akron v. Akron Ctr. of Reprod. Health*, 462 U.S. 416, 437 (1983) (referencing the American Public Health Association Recommended Program Guide for Abortion Services); *Roe*, 410 U.S. at 144-5 (referencing the American Public Health Association adopted standards for Abortion Services).

⁷⁸ See, e.g., *Richmond v. J.A. Croson Co.*, 488 U.S. 469, 477 (1989) (referencing that a federal program that had 10 percent set aside for minority contractors did not violate equal protection); *L.A. Water Dep't v. Manhart*, 435 U.S. at 705, n.3 (referencing a common percentage used in the calculation for pension benefits for employees).

⁷⁹ See, e.g., *Hodgson v. Minnesota*, 497 U.S. 417, 442 n.29 (1990) (referencing judges' opinions as to specific events within the judges' courtrooms).

⁸⁰ See *infra* Table 2.

⁸¹ *Guerra*, 479 U.S. at 272.

⁸² *Bowers*, 478 U.S. at 202.

⁸³ 208 U.S. 412 (1908).

States Reports. Only constitutional law and sex-based discrimination had multiple editions that included sufficient cases for trend analysis. Evidence casebooks typically included only one case with scientific discourse in any form, if they included any such cases at all. Only one evidence casebook contained more than one case with scientific discourse and even that casebook contained only one case in opinion form and had only notes on three others.⁸⁴ This precluded inter-edition analysis. To be fair, the one case in opinion form included a larger percentage of scientific discourse than did the officially reported opinion, and the three noted cases briefly addressed scientific discourse. Unfortunately, this was an anomaly relative to what resulted from analysis of the other subject matter casebooks.

1. *Constitutional Law*

Examination of the Dowling (founding editor) et al. *Cases on American Constitutional Law*⁸⁵ editions demonstrated that when the case was presented in opinion form it was much more likely to have a smaller percentage than the officially reported opinion. Of the cases appearing in opinion form, there were a total of twenty-seven increases in percentage, and forty-seven decreases in percentage, while one case maintained the same percentage. Some cases, like *Daubert*⁸⁶, *McCleskey*,⁸⁷ *Guerra* and *Hodgson*⁸⁸ were not included at all in any of the editions, or were barely mentioned in the editors' notes. Even when these cases were included in the editors' notes, the editors made no mention of their connection to scientific evidence or discourse.

The Lockhart et al. *Constitutional Law: Cases, Comments, Questions*⁸⁹ editions

⁸⁴ RICHARD O. LEMPert ET AL., A MODERN APPROACH TO EVIDENCE: TEXT, PROBLEMS, TRANSCRIPTS AND CASES (3d ed. 2000); RICHARD O. LEMPert & STEPHEN A. SALTzBURG, A MODERN APPROACH TO EVIDENCE: TEXT, PROBLEMS, TRANSCRIPTS AND CASES (2d ed. 1982); RICHARD O. LEMPert & STEPHEN A. SALTzBURG, A MODERN APPROACH TO EVIDENCE: TEXT, PROBLEMS, TRANSCRIPTS AND CASES (1st ed. 1977).

⁸⁵ GERALD GUNTHER & KATHLEEN SULLIVAN, CONSTITUTIONAL LAW (15th ed. 2004); GERALD GUNTHER & KATHLEEN SULLIVAN, CONSTITUTIONAL LAW (14th ed. 2001); GERALD GUNTHER & KATHLEEN SULLIVAN, CONSTITUTIONAL LAW (12th ed. 1997); GERALD GUNTHER, CONSTITUTIONAL LAW (11th ed. 1991); GERALD GUNTHER, CONSTITUTIONAL LAW (10th ed. 1985); GERALD GUNTHER, CONSTITUTIONAL LAW (9th ed. 1980); GERALD GUNTHER, CASES AND MATERIALS ON CONSTITUTIONAL LAW (8th ed. 1975); NOEL T. DOWLING & GERALD GUNTHER, CASES AND MATERIALS ON CONSTITUTIONAL LAW (7th ed. 1970); NOEL T. DOWLING & GERALD GUNTHER, CASES AND MATERIALS ON CONSTITUTIONAL LAW (6th ed. 1965); NOEL T. DOWLING, CASES ON CONSTITUTIONAL LAW (5th ed. 1959); NOEL T. DOWLING, CASES ON CONSTITUTIONAL LAW (4th ed. 1954); NOEL T. DOWLING, CASES ON CONSTITUTIONAL LAW (3d ed., 1950); NOEL T. DOWLING, CASES ON CONSTITUTIONAL LAW (3d ed. 1946); NOEL T. DOWLING, CASES ON CONSTITUTIONAL LAW (2d ed., 1941); NOEL T. DOWLING, CASES ON CONSTITUTIONAL LAW (1st ed., 1937).

⁸⁶ *Daubert*, 509 U.S. at 579.

⁸⁷ *McCleskey*, 481 U.S. at 279.

⁸⁸ *Hodgson*, 497 U.S. at 417.

⁸⁹ WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (8th ed 1996); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (7th ed 1991); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (6th ed 1986); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (5th ed 1980); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (Supp. 1979); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (4th ed 1975); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (3d ed 1970); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (2d ed 1967); WILLIAM B. LOCKHART ET AL., CONSTITUTIONAL LAW: CASES, COMMENTS, QUESTIONS (1st ed 1964).

demonstrated that when the case was included in opinion form, the case was more likely to have a smaller percentage of scientific discourse than did the officially reported opinion. Of the cases provided in opinion form, there were a total of seventeen increases in percentage, and twenty-three decreases in percentage, while one case stayed the same. The following cases were either not included in opinion form, or not included at all: *Griggs*,⁹⁰ *Manhart*,⁹¹ *Barefoot*,⁹² *Bowers*, *Guerra*, and *Daubert*.

The Stone et al. *Constitutional Law*⁹³ editions also contained cases in opinion form that were more likely to include a smaller percentage of scientific discourse than did the officially reported opinions. There were a total of ten increases in percentage, and nineteen decreases in percentage, while one case maintained the same percentage as the officially reported opinion. Again, if the following cases were included at all, there was no mention of the scientific discourse involved in their issues or opinions: *Griggs*, *Dothard*⁹⁴, *Manhart*, *Barefoot*, *Guerra*, *Hodgson*, and *Daubert*.

2. Evidence

The evidence editions contained surprisingly few cases in opinion form, and typically did not include any of the cases selected for this study. So few cases were included in the evidence editions that rendering a table to express the results would be of little value. Of the two series of casebooks examined, only one of them included multiple cases, and those were included only in the most recent edition. However, a key difference between the evidence casebooks and the other subject casebooks was found when examining the Table of Contents in addition to the Table of Cases.

In Louisell et al.'s *Cases and Materials on Evidence*,⁹⁵ only a few of the editions included cases containing scientific discourse;⁹⁶ however, a majority of editions⁹⁷

⁹⁰ *Griggs v. Duke Power*, 401 U.S. 424 (1971).

⁹¹ *L.A. Dep't. of Water & Power*, 435 U.S. at 702.

⁹² *Barefoot v. Estelle*, 463 U.S. 880 (1983).

⁹³ GEOFFREY R. STONE ET AL., *CONSTITUTIONAL LAW* (3d ed. 2005); GEOFFREY R. STONE ET AL., *CONSTITUTIONAL LAW* (2d ed. 1996); GEOFFREY R. STONE ET AL., *CONSTITUTIONAL LAW* (3d ed. 2005).

⁹⁴ *Dothard v. Rawlinson*, 433 U.S. 321 (1977).

⁹⁵ JON R. WALTZ & ROGER C. PARK, *CASES AND MATERIALS ON EVIDENCE* (10th ed. 2004); JON R. WALTZ & ROGER C. PARK, *CASES AND MATERIALS ON EVIDENCE* (9th ed. 1999); JON R. WALTZ & ROGER C. PARK, *CASES AND MATERIALS ON EVIDENCE* (8th ed. 1995); JOHN KAPLAN ET AL., *CASES AND MATERIALS ON EVIDENCE* (7th ed. 1992); JOHN KAPLAN & JON R. WALTZ, *CASES AND MATERIALS ON EVIDENCE* (6th ed. 1987); JOHN KAPLAN & JON R. WALTZ, *CASES AND MATERIALS ON EVIDENCE* (5th ed. 1984); DAVID W. LOUISELL ET AL., *CASES AND MATERIALS ON EVIDENCE* (4th ed. 1981); DAVID W. LOUISELL ET AL., *CASES AND MATERIALS ON EVIDENCE* (3d ed. 1976); DAVID W. LOUISELL ET AL., *CASES AND MATERIALS ON EVIDENCE* (2d ed. 1972); DAVID W. LOUISELL ET AL., *CASES AND MATERIALS ON EVIDENCE* (1st ed. 1968).

⁹⁶ See WALTZ & PARK, *supra* note 92, at 867-875 (10th ed. 2004); WALTZ & PARK, *supra* note 92, at 841-849 (9th ed. 1999); WALTZ & PARK, *supra* note 92, at 777-784 (8th ed. 1995); LOUISELL ET AL., *supra* note 92, at 831-836 (3d ed. 1976).

⁹⁷ See WALTZ & PARK, *supra* note 92, at 745-748 (10th ed. 2004); WALTZ & PARK, *supra* note 92, at 724-727 (9th ed. 1999); WALTZ & PARK, *supra* note 92, at 684-687 (8th ed. 1995); KAPLAN & WALTZ, *supra* note 92, at 711-714 (7th ed. 1992); KAPLAN & WALTZ, *supra* note 92, at 756-760 (6th ed. 1987); KAPLAN & WALTZ, *supra* note 92, at 746-750 (5th ed. 1984); LOUISELL ET AL., *supra* note 92, 625-628 (4th ed. 1981).

included an excerpt from *McCormick's Handbook of the Law and Evidence* entitled, "Social and Economic Data Used in Judicial Law-Making: 'legislative' fact."⁹⁸ Additionally, all of the editions devoted an entire chapter to scientific evidence typically entitled, "Scientific and Demonstrative Evidence."⁹⁹ While most of the editions contained no target cases, those that did either had a larger percentage of scientific discourse than the officially reported opinion or they had a slightly smaller percentage than the officially reported opinion. This makes it difficult to conclude whether or not this series supports our general hypothesis of overall smaller percentages of scientific discourse found in casebook opinions than their officially published versions.

Lempert et al.'s *A Modern Approach to Evidence: Text, Problems, Transcripts and Cases*, seemed to demonstrate some growing attention to scientific discourse on the part of the editors.¹⁰⁰ The first edition in 1977 contained no special chapter addressing scientific evidence, nor did it contain any target cases. However, Chapter 11 in that edition had a section called "Examples of Scientific Evidence" that reviewed how to present expert testimony and discussed examples of scientific evidence and the mechanics of expert testimony.¹⁰¹ The 1982 edition had the same arrangement, except this time it cited *Frye*.¹⁰² Of course, *Frye* is not in this study's list of cases, but it was the long-standing standard for evaluation of scientific evidence before *Daubert* was decided in 1993, so it has an important position in the history of judicial handling of scientific evidence. Finally, the 2000, third edition of Lempert et al.'s casebook also contained no special chapter, but it included in Chapter 9 a section called, "Special Issues Concerning Scientific Evidence."¹⁰³ More importantly, unlike prior editions, it included a lengthy discussion¹⁰⁴ about *Frye* and it included *Barefoot* in full opinion form.¹⁰⁵ It also included in the editors' notes just six or seven lines addressing science from *Roe* and *Brown*.¹⁰⁶ Finally, this section gave *Daubert* a lot of attention without quoting much of the opinion, so it was impossible to discern a percentage for it. As for *Barefoot*, this casebook edition included 77.4 percent of the opinion as scientific discourse. This is more than twice that of the officially reported opinion (at 34.6 percent).

3. Sex-Based Discrimination

Kay et al.'s *Text, Cases and Materials on Sex-Based Discrimination* was the only

⁹⁸ CHARLES TILFORD MCCORMICK, *MCCORMICK'S HANDBOOK OF THE LAW OF EVIDENCE* (2nd. ed. 1972).

⁹⁹ See WALTZ & PARK, *supra* note 92, at 862-991 (10th ed. 2004); WALTZ & PARK, *supra* note 92, at 841-956 (9th ed. 1999); WALTZ & PARK, *supra* note 92, at 777-843 (8th ed. 1995); KAPLAN & WALTZ, *supra* note 92, at 802-848 (7th ed. 1992); KAPLAN & WALTZ, *supra* note 86, at 844-869 (6th ed. 1987); KAPLAN & WALTZ *supra* note 92, at 836-861 (5th ed. 1984); LOUISELL ET AL., *supra* note 92, 770-805 (4th ed. 1981); LOUISELL ET AL., *supra* note 92, at 1070-1103 (3d ed. 1976); LOUISELL ET AL., *supra* note 92, at 1146-1199 (2d ed. 1972); LOUISELL ET AL., *supra* note 92, at 1174-1226 (1st ed. 1968).

¹⁰⁰ See *supra* note 84.

¹⁰¹ LEMPERT & SALTZBURG, *supra* note 84, at 998-1033 (1st ed. 1977).

¹⁰² LEMPERT & SALTZBURG, *supra* note 84, at 861-64, 956, 968-69, 971 (2d ed. 1982).

¹⁰³ LEMPERT ET AL., *supra* note 84, at 1039-1054 (3d ed. 2000).

¹⁰⁴ *Id.* at 1039-44.

¹⁰⁵ *Id.* at 1081-84.

¹⁰⁶ *Id.* at 1287.

sex discrimination casebook series we examined.¹⁰⁷ Despite the fact that it contained many of the cases targeted in our study, it too showed more percentage decreases than increases when included opinion form cases were compared to the officially reported opinions. Of the cases provided in opinion form, there were a total of nine increases in percentage, seventeen decreases in percentage, and none of the cases maintained the same percentage. The following cases, if mentioned at all, did not contain any scientific discourse: *Brown*,¹⁰⁸ *Barefoot*, *Bowers*, *Hodgson*, and *Daubert*.

Interestingly, this casebook provided something none of the other examined casebooks contained. The third and fourth editions included *Guerra* which provided some limited discussion about legislative intent.¹⁰⁹ The officially reported version of the *Guerra* opinion included extensive discussion about legislative intent,¹¹⁰ but much of this discussion was edited out of versions included in the constitutional law casebooks. Additionally, six lines of scientific discourse were provided in the editors' notes of the following cases: *McCleskey* and *Croson*. Such discussion of legislative intent was not found in any other casebook examined for this project.

B. Trend

If the turning outward trend were a reality in legal education and has reached casebook editors, then later editions of casebooks should include cases with larger percentages of scientific discourse than earlier versions of the same casebook. If the trend were taking hold with casebook editors, casebooks should include successively larger (or *escalating inclusion*) percentages of scientific discourse from one edition to the next. This should be the situation despite what the general analysis in Section VII.A. indicates.

Two stages were involved in determining whether or not this expectation was justified. First, the data used for the general analysis described in Section VII.A., which is the increases and decreases of science lines, were reorganized to allow for closer examination of science discourse inclusion *throughout* a casebook series. A table was created listing the decreases and increases of science line percentages within a casebook series and arranged per case. That is, each edition that included a particular case had a percentage of scientific discourse lines that was less than, more than, or the same as the originally published opinion. The values shown in Table 3 are the differences between the two percentages. The percentage differences that occurred within each casebook series were organized *consecutively* in ascending order of publication date and are detailed in Table 3.

This stage provided more specific information than was provided by the general analysis in Section VII.A. because it displayed values for percentage differences *per each casebook edition* in chronological order, instead of the values per target case as

¹⁰⁷ HERMA HILL KAY & MARTHA S. WEST, TEXT CASES AND MATERIALS ON SEX-BASED DISCRIMINATION (4th ed. 1996); HERMA HILL KAY, TEXT CASES AND MATERIALS ON SEX-BASED DISCRIMINATION (3d ed. 1988); HERMA HILL KAY, TEXT TEXT CASES AND MATERIALS ON SEX-BASED DISCRIMINATION (2d ed. 1981); HERMA HILL KAY ET AL., TEXT CASES AND MATERIALS ON SEX-BASED DISCRIMINATION (1st ed. 1974).

¹⁰⁸ *Brown v. Bd. of Educ. of Topeka*, 347 U.S. 483 (1952).

¹⁰⁹ See KAY, *supra* note 107, at 549-62 (3d ed. 1988); KAY & WEST *supra* note 107, at 749-62 (4th ed. 1996).

¹¹⁰ *Guerra*, 479 U.S. at 285-290.

is discussed in Section VII.A.

1. Stage One- Reorganization

Initial examination of the reorganized data generally indicated that when a casebook series included a case in opinion form, the included material contained smaller percentages of scientific discourse more often than larger percentages within each casebook set (throughout the editions).

Table 4 summarizes the detailed results from Table 3 and to better understand this summary table, some examples are useful. Looking at *Brown*, in the Dowling/Gunther constitutional law casebook series,¹¹¹ one can see that this case experienced a total of four decreases in science line percentage, and six increases in science line percentage *throughout* the fifteen editions. Not all fifteen editions included the case, but of the ten that did, four contained less scientific discourse, and six contained more scientific discourse. This stage of the trend analysis focused on the casebook editions, following a particular case through the editions, which provides more specific information than did the more general analysis detailed in Section VII.A. Another example comes from the Kay et al. sex-based discrimination casebook series.¹¹² All four editions contained the case, *Frontiero v. Richardson*,¹¹³ and each edition included smaller science line percentages.¹¹⁴ Table 3 addressing inter-edition percentage comparisons per subject matter further elucidates these results.

a. Constitutional Law

Looking at how particular cases were treated *throughout* these series, one can see that later editions of constitutional law casebooks tended to include smaller percentages of scientific discourse than the earlier editions. Analysis showed that later editions of constitutional law casebooks indicated generally *declining* inclusion of science lines in all cases except *Brown*,¹¹⁵ *Craig v. Boren*,¹¹⁶ and *Casey*,¹¹⁷ where later editions tended to include larger percentages of scientific discourse than did the earlier editions. Increases and decreases of scientific discourse inclusion in constitutional law casebook editions fluctuated a little for *Akron*¹¹⁸ and *Croson*¹¹⁹ (thus, no asterisk). It is difficult to determine why casebook editors would generally include progressively more scientific discourse for *Brown*, *Craig v. Boren*, and *Casey* in particular. One might imagine that in these cases scientific discourse was more closely tied to the issue the court was attempting to resolve, something only future research would reveal.

¹¹¹ See *supra* note 85.

¹¹² See *supra* note 107.

¹¹³ 411 U.S. 677 (1973).

¹¹⁴ KAY & WEST, *supra* note 107, at 31, 38-40, 53, 75, 129, 151, 224, 346, 746 (4th ed. 1996); KAY, *supra* note 100, at 20, 27-29, 43, 68, 108, 109, 137, 166, 217, 318, 519 (3d ed. 1988); KAY, *supra* note 107, at 16, 42, 51, 52, 71, 78, 104, 134-136, 193, 301 (2d ed. 1981); KAY ET AL., *supra* note 107, at 20, 27, 28, 29, 43, 68, 108, 109, 137, 166, 217, 318, 519 (1st ed. 1974).

¹¹⁵ *Brown*, 347 U.S. at 483.

¹¹⁶ *Craig v. Boren*, Governor of Okla., 429 U.S. 190 (1976).

¹¹⁷ *Planned Parenthood of Southeastern Pa. v. Casey*, 505 U.S. 833 (1992).

¹¹⁸ *Akron v. Akron Ctr. for Reprod. Health, Inc.*, 462 U.S. 416 (1983).

¹¹⁹ *Richmond v. J.A. Croson Co.*, 488 U.S. 469 (1989).

These results, and the results for the remaining constitutional law and sex discrimination law casebooks, are summarized in Table 4 by the asterisks at the bottom of the table. One asterisk indicates that as later editions of the casebook were published, there was *generally declining inclusion* of science lines in the included cases. Two asterisks indicate that as later editions of the casebook were published, there was *generally escalating inclusion* of science lines in the included cases. The lack of an asterisk indicates that no declining or escalating trend could be determined based on percentage fluctuations. To clarify how Table 4 was developed to summarize the information in Table 3, when increases and decreases fluctuated at the same frequency, no upward or downward trend was apparent. However, if there were more of one than the other, for instance, with Kay et al.'s Sex Discrimination casebook for *Muller v. Oregon* (began with one increase which was followed by three decreases), then a trend of declining inclusion was determined.¹²⁰

b. Sex-Based Discrimination

Looking again at how particular cases were treated *throughout* a series, results showed that later editions of Kay et al.'s sex-based discrimination¹²¹ casebooks tended to include smaller percentages of scientific discourse than did earlier editions. This is one of the ways the results for this casebook series showed some similarities to the constitutional law casebook results. And, as with the constitutional law casebooks, there were exceptions. For *Griggs*,¹²² *Craig v. Boren*, *Califano*,¹²³ and *Akron*, later editions tended to include larger percentages of scientific discourse than did earlier editions. Unlike the trend with the constitutional law books (*Akron* and *Croson*), there were no cases where increases and decreases fluctuated over the course of casebook editions.

Again, it is difficult to determine why these four cases, out of the nineteen, were treated differently from the others with regard to inclusion of scientific discourse. It is, however, reassuring to see that casebooks in two subject matter areas included more of this discourse on one of the same cases. It may be useful in future research to examine in what ways *Craig v. Boren* differs from the other cases.

The results from this stage shed some light on how different editions of the same casebook treat various cases. The real value, however, comes from how this stage prepares the data to be analyzed chronologically. In fact, reaching conclusions about editorial trends based on this inter-edition analysis of the data is not meaningful without looking at whether or not the decreases are in the more recent casebook editions. For this stage, Table 3 provides the necessary information. Please note that for Table 3, the percentage values read as text would read; they are listed in chronological order from left to right with the first row representing the earliest editions. For example, in looking at Table 3, one can see that Stone's inclusion of *Roe v. Wade* spanned all four editions. One can also see that the *first* edition contained *6.8 percent less* (-6.8) scientific discourse than the originally published opinion; the *second* edition contained *6.5 percent less* (-6.5) scientific

¹²⁰ See *supra* note 107.

¹²¹ *Id.*

¹²² *Griggs*, 401 U.S. at 424.

¹²³ *Califano v. Webster*, 430 U.S. 313 (1977). Please note the citation for the only examined case not discussed in the text: *Washington v. Davis*, 426 U.S. 229 (1976).

discourse; the *third* edition contained *10 percent less* (-10) scientific discourse; and the *fourth* edition contained *5.8 percent less* (-5.8) scientific discourse. Examining the fluctuations of increases and decreases throughout the series of the casebook is also informative and leads to a second stage trend analysis.

2. Stage Two - Change Dynamics Trend Analysis

The second stage trend analysis extended the chronological analysis that began in the first stage. It involved the determination of whether subsequent casebook editions showed *generally escalating inclusion* of science lines (progressively larger percentages of science lines than the previous edition), or *generally declining inclusion* of science lines (progressively smaller percentages of science lines than the previous edition). This involved a closer inspection of inter-edition percentage differences, by allowing comparison of the second edition with the first, the third edition with the second, and so on. Subsequent editions were only compared with the most recent one, and not with the first edition of the series.

As partially explained earlier in this section, analysis results do not indicate that the change dynamics (how a case opinion is treated from one edition of a casebook to the next) demonstrate adherence to the turning outward trend. Were the change dynamics to so indicate, one would at least see the fourth edition of a casebook to have a higher percentage of inclusion than the third and so on, even if that percentage was still less than was contained in the originally published opinion. This particular change dynamic would have to be seen more consistently than the results in Tables 3 and 4 demonstrate in order to confidently conclude that casebook editors are following the turning outward trend. Instead, declining inclusion (subsequently smaller percentages of science lines in a case between casebook editions in the same series) occurred more often than did escalating inclusion (subsequently larger percentages of science lines in a case between casebook editions in the same series).

For example, looking at *Brown* again in the Dowling/Gunther constitutional law casebook series in Table 3, one finds escalating inclusion (as indicated by the double asterisk in Table 4). This is indicated by the fact that almost every time a new edition of the casebook was published, if the percentage of included scientific discourse did not remain the same, it went up (e.g., -.3 in the sixth edition increases to -.1 in the seventh edition, and despite minor fluctuation, the general trend indicates escalating inclusion because the thirteenth, fourteenth, and fifteenth editions are all increased to +.2.) Therefore, in this study the editors of the casebook series appear to be following the turning outward trend as shown by the increasingly greater percentage of scientific discourse lines in the more recent editions.

However, looking at *Roe v. Wade*¹²⁴ in the same casebook series, when the case treatments are compared with one another, it is evident that the editors progressively included smaller percentages of science lines (declining inclusion - as indicated by the single asterisk in Table 4). Table 3 shows us that the inclusion percentages started out as less than that of the original publication (e.g., ninth edition had 3.3 percent less discourse, or, -3.3), but as later editions were published, they generally included even less scientific discourse (e.g., eleventh edition had 4 percent less, or, -

¹²⁴ 410 U.S. 113 (1973).

4, and then the twelfth edition had 4.6 percent less discourse, or, -4.6).

As shown in Table 4, declining inclusion occurred on thirty-two occasions while escalating inclusion only occurred on fifteen occasions. The results of this second stage naturally conflict with the authors' expectations that a close analysis of how cases are treated within a series would reflect some turning outward on the part of casebook editors. Therefore, the present study does not indicate evidence that casebook editors are following the turning outward trend.

VIII. DISCUSSION

The results of the present study indicate that despite the apparent trend of judicial 'turning outward' to other disciplines, particularly the sciences, this trend has only reached the instructional materials used in legal education to a small degree. This is important to recognize because in order for legal practitioners to competently handle scientific evidence, they should have at least some exposure to scientific discourse and a basic understanding of the underlying principles of scientific methodology. Without this important training, as so astutely pointed out in the *Barefoot* dissent, judges (and lawyers) are unable to discern the "wheat from the chaff."¹²⁵ Currently seated judges may make attempts to teach themselves the basics of scientific principles, or more prudently, seek guidance from the experts. However, these options provide a severely limited solution given the prevalent use of scientific methodology in court. Judges may have neither the time nor the foundations necessary to teach themselves this methodology, and experts typically only assist on a case-by-case basis.

The most comprehensive solution is to help alleviate the problem where it begins, in law school, by increasing law students' exposure to scientific discourse and methodology *before* they are barred, and before they take office as judges or policy-makers. Through this exposure law students will be familiar with the underlying principles and the attendant discourse of science, and thus be in better positions to understand and utilize scientific evidence. Furthermore, an appreciation for the basic tenets of scientific methodology can only improve the intellectual ability of lawyers because it requires them to be able to account for discrepancies, much like they do when making legal arguments.

These results indicate that even though some casebooks reflect how critical a role scientific discourse plays in judicial opinions, casebooks as a whole do not reflect this role as much as do the officially reported opinions. Because casebooks are the primary pedagogical tool used to educate, train, and indoctrinate law students, this circumstance suggests that law students will continue to receive inadequate exposure to a discourse they will inevitably encounter later on as lawyers, policymakers, or judges. Furthermore, given that law schools typically do not require, and rarely offer, any coursework relevant to science, legal education will continue to send ill-prepared law graduates out into their chosen professions.¹²⁶

The failure to properly equip law students with the fundamental of scientific discourse negatively affects legal professionals, their clients, and by extension, the society which is bound by the laws that are decided by these professionals. Exposing

¹²⁵ *Barefoot*, 463 U.S. at 929 (Blackmun, J., Brennan, J., and Marshall, J., dissenting).

¹²⁶ See Corbin, *supra* note 30.

law students to basic scientific discourse and educating them in basic scientific principles, is critical to ensuring their future competency in handling scientific evidence. It is also critical to ensuring that fairness exists in our court and legislative systems.

In *Daubert*, the leading Supreme Court case on how courts are to handle scientific evidence, the Court attempted to provide judges with two important messages. First, judges cannot relinquish responsibility for assessing the evidentiary worth of testimony to experts. Second, the Court implied that judges should embrace admissibility standards that promote expert communities willing to develop the best information possible on issues that are relevant to law.¹²⁷ There is, however, a danger inherent to giving judges this responsibility. Essentially, judges could be susceptible to a type of intellectual “snake oil,” like the “remedies” hawkers used to sell in frontier days to unsuspecting victims.¹²⁸

While some judges may not be concerned by this problem, others are likely to take on the challenge of broadening their knowledge in order to avoid it. As implied by the research cited in Section I, there are options available to judges who wish to further their own instruction in science. In fact, since *Daubert*, many workshops, seminars, and various continuing education programs have come into existence around the nation; so have many reference books that are specifically designed to help lawyers and judges understand the science that underlies scientific evidence.¹²⁹ Even though this is an admirable beginning, the sufficiency of these options remains to be seen given the critical policy-making tasks faced by judges. And, as indicated by the Dobbins’ et al. research, judges still feel inadequately prepared to fulfill their responsibilities regarding scientific evidence.¹³⁰ It is clear though that legislators cannot satisfactorily make law, executive actors cannot effectively enforce the law, and judges cannot determine what the law means if they are uneducated in science. In order to address this problem adequately, it must be addressed from the very beginning, during legal training and acculturation.

As courts go about their daily determinations of what the law means, they typically seek guidance from authorities beyond what is written in the law’s text. They also regularly depend on facts that are amenable to scientific inquiry. These facts can be supported by the work of scientists who, like other authorities, do not determine specific results, but do provide judges with guidance. The relationship between scientists and law professionals has been likened to a dialogue and naturally depends on everyone understanding the other’s language.¹³¹ Otherwise, legal policymakers will not be able to distinguish fact from advocacy, and will thus be, to use the snake oil analogy again, as vulnerable as hapless frontiersmen.¹³²

IX. IMPLICATIONS FOR FUTURE RESEARCH

This foundational scientific determination that the turning outward trend has not quite reached legal education is critical to setting the stage for future research. One

¹²⁷ FAIGMAN, *supra* note 13, at 87-88.

¹²⁸ *See id.* at 194-195 (“lawmakers are sitting ducks for the latest snake oil syndrome”).

¹²⁹ *Id.* at 200.

¹³⁰ *See generally* Dobbins et al., *supra* note 3.

¹³¹ FAIGMAN, *supra* note 13, at 121.

¹³² *Id.* at 194-195.

of the most difficult challenges faced in this study was the lack of foundation on which to build. The current social science literature contains no exploration of how casebook contents influence the way law students learn. Furthermore, many of the premises used to frame this study's argument have not been examined scientifically. For instance, no scientific research can be found in the current literature that examines why casebook editors edit the way they do. One can surmise that there are time and resource constraints that influence an editor's decisions about which leading cases to include, and what parts of those leading cases to include.

A further issue is the difficulty inherent in determining whether scientific discourse is edited out at a higher rate than other aspects of a case. Determining all the various categories under which the multitude of words in a United States Supreme Court case could fall would be a daunting task indeed. It would be a very useful one though, and the authors would like to invite legal and other social science scholars to pursue a scientific examination of this and the many other related questions ripe for investigation.

Other limitations to this study involve its methodology. This study involves some range restriction problems in the sample. Leading United States Supreme Court cases were used because they are the most likely to be contained in law school casebooks. The primary goal of this study was to see what law students see and determine what is missing from their view. Therefore, the majority opinions of leading U.S. Supreme Court cases are the best choice because they are the primary component of casebooks, and casebooks are primarily what law students read.¹³³ Occasionally, a dissenting opinion will include scientific discourse.¹³⁴ Dissenting opinions do not come without their own limitations however. Anecdotally, law students tend to be required to read many cases per class, and classroom discussion tends to focus on the majority opinion because that is the opinion the court offers as its official treatment of a legal issue. The majority opinion is, essentially, the opinion that sets the court's policy out for the public. The majority opinion, not the dissent, comprises case law. Notwithstanding the majority opinion's power, a scientific exploration of dissents may reveal interesting results.

Another limitation resulting from the usage of U.S. Supreme Court opinions is that these are predominantly appellate opinions and they more often examine questions of law, than of fact. This means that the facts are typically not at issue. This is significant because fact-finding is where science comes into play. Even though an exploration of trial level courts (where questions of fact are involved) would not have been appropriate for this study's purposes (to examine what law students are exposed to in casebooks) such exploration would be very important future research for anyone interested in how trial courts handle scientific evidence.

A final limitation of this study worth noting has to do with a more specific aspect of text analysis. Even though the content analysis used for this study was relatively simple and straightforward, there is some concern about the font sizes of the text in the different casebooks. Even though many of the casebooks were published by the same company, West Publishing Co., and would be expected to adhere to the same set of font and type regulations, not all of them do. Additionally, even those published by the same company were naturally not all published in the same year so

¹³³ See generally Henderson, *supra* note 4.

¹³⁴ See, e.g., *Bowers*, 478 U.S. at 203 n.2.

some of the font and type regulations could have changed over time. An interesting study for the future could be a replication of this study, but using word counts instead of line counts to determine any differences in the results.

Despite this study being focused at the individual casebook level of analysis, legal education as a whole is of considerable interest. It is important to note that even though legal education generally appears to adhere to its formalistic, doctrinal origins, there is evidence that some law schools are aware of what other disciplines and methodologies have to offer. A good example of this is George Mason University School of Law which requires all of its law students to take a course entitled "Economic Foundations of Legal Studies."¹³⁵ Despite the fact that the course is taught in the traditional Socratic method, it still teaches the importance of the connection between economics and the law. Admirable as these efforts are, they still do not indicate whether law schools as institutions are also turning outward to other disciplines as much as courts are turning outward.

Given that this study supports the notion that law schools are not turning out to science as much as the courts are, there is obvious cause for concern that this cycle will continue into the future. A closer look at particular law schools reveals that the situation may not be so discouraging. A handful of law schools offer courses that focus on scientific discourse, particularly as applied in a legal setting. George Mason University School of Law is one such institution with courses such as Law, Science and Technology (case studies), Mental Illness Law (involves doctrine and cases), Statistics for Lawyers and Policy Analysts (taught like a math class), Quantitative Forensics (statistical evaluation of forensic and economic evidence), and Law and Social Science Seminar (examines relationship between social science study and legal practice).¹³⁶ And while none of the courses is required (unlike the Economic Foundations of Legal Studies course just mentioned), they are still offered as electives.¹³⁷ Potential future research could analyze this institution and others that offer similar courses to determine the motivations behind the administrative decision to offer such courses. Do law school administrators recognize the need to prepare future lawyers and judges to handle scientific evidence? How serious do they view this need to be? Only a deeper look into the inner workings of legal education institutions will help us answer these pertinent questions.

X. CONCLUSION

Some judges may make efforts to educate themselves on scientific principles despite overburdened schedules. These efforts may involve directing their clerks to provide them with a 'nutshell', or list of relevant definitions. Also, judges may call upon the services of an organization called Court Appointed Scientific Experts (CASE) to provide a paid, third-party expert's explanation of the relevant evidence.¹³⁸ However, these experts typically do not provide the judge with a

¹³⁵ George Mason University School of Law: Academics: Fall 2007 JD Requirements, <http://www.law.gmu.edu/academics/Fall2007JD-req.php> (last visited Oct. 21, 2007).

¹³⁶ George Mason School of Law: Academics: Complete Course List, <http://www.gmu.edu/academics/course-list.php> (last visited Oct. 21, 2007).

¹³⁷ Interview with Ms. Iva Futrell, Associate Law Librarian, George Mason University School of Law (July 25, 2005). Ms. Futrell is responsible for procuring reserve books for law faculty.

¹³⁸ See generally American Association for the Advancement of Science, Court Appointed Scientific

tutorial on the essentials of scientific analysis, but instead provide an independent expert opinion of the evidence relevant to a specific case. None of these methods is sufficient to provide judges with basic instruction in scientific concepts and discourse generally by someone skilled in science or pedagogy, or both.¹³⁹

Some may argue that lawyers may not bother with learning anything about the science they are using, or how to understand it at even a basic level, because it is mere “window dressing.” This argument should in no way be disregarded. However, in the spirit of the Legal Realists, it can also be argued that legal rules are used as window dressing and case outcomes may be better understood as a product of the judge’s choice of breakfast foods than anything else. If this argument is used to exclude scientific instruction, then the same argument could be used to exclude doctrinal instruction, which constitutes nearly all of law school instruction.

There is also some concern that legal education institutions are not amenable to change due to a variety of factors. First, the case method plays a primary role in justifying law schools and making the bar more professional.¹⁴⁰ Second, the case method is less expensive than a method involving more student-teacher interaction in and outside of the classroom. Henderson provides some suggestions about how to overcome these obstacles, primarily focusing on the ABA’s role in establishing requirements for law school admissions and law schools’ requirements for teaching.¹⁴¹ Discussion of her insightful suggestions; however, is beyond the scope of this paper. To be sure, the purpose of the present study is not to criticize the case method or question its role in legal education, but to shed light on the problematic nature of the materials used in the case method.

In the meantime, it would appear that law schools will continue to churn out new lawyers who have not had sufficient exposure to scientific discourse during their law school years. Research on future casebook series, or other casebook series not included in this study, may show that casebook editors are recognizing the turning outward trend of the courts along with the prevalence of science in the courtroom and other places where lawyers ply their trade. The hope is that such recognition will be borne out by their editing decisions about what they include in their casebooks.

Experts: Judges Handbook Version 3.0 (2002).

¹³⁹ The authors here do not deny that a judge may have a clerk that can self-educate in scientific discourse for the purposes of a particular case, and then inform the judge. However, that clerk is not much more likely to have more background in science than does the judge.

¹⁴⁰ Henderson, *supra* note 4, at 48-53.

¹⁴¹ *Id.* at 74-78.

TABLE 1. TABLE OF CASES INCLUDED IN ANALYSIS ARRANGED BY YEAR OF DECISION.

Case Name	Year	Cite
<i>Muller v. Oregon</i>	(1908)	208 U.S. 412
<i>Brown v. Bd. of Educ. of Topeka</i>	(1954)	347 U.S. 483
<i>Griggs v. Duke Power Co.</i>	(1971)	401 U.S.424
<i>Frontiero v. Richardson</i>	(1973)	411 U.S. 677
<i>Roe v. Wade</i>	(1973)	410 U.S. 113
<i>Washington v. Davis</i>	(1976)	426 U.S. 229
<i>Califano v. Webster</i>	(1977)	430 U.S. 313
<i>Craig v. Boren</i>	(1977)	429 U.S. 1124
<i>Dothard v. Rawlinson</i>	(1977)	433 U.S. 321
<i>L. A., Dep't of Water & Power v. Manhart</i>	(1978)	435 U.S. 702
<i>Akron v. Akron Ctr. for Reprod. Health, Inc.</i>	(1983)	462 U.S. 416
<i>Barefoot v. Estelle</i>	(1983)	463 U.S. 880
<i>Bowers v. Hardwick</i>	(1986)	478 U.S. 186
<i>Cal. Fed. Sav. and Loan Ass'n v. Guerra</i>	(1987)	479 U.S. 272
<i>McCleskey v. Kemp</i>	(1987)	481 U.S. 279
<i>Richmond v. J. A. Croson Co.</i>	(1989)	488 U.S. 469
<i>Hodgson v. Minnesota</i>	(1990)	497 U.S. 417
<i>Planned Parenthood of Southeastern Pa. v. Casey</i>	(1992)	505 U.S. 833
<i>Daubert v. Merrell Dow Pharm., Inc.</i>	(1993)	509 U.S. 579

TABLE 2. PERCENTS OF SCIENTIFIC DISCOURSE LINES FOR INCLUDED CASES

	A	B	C	D
	Case Name	Year	Cite	% science lines
1	<i>Muller v. Oregon</i>	1908	208 U.S. 412	7.3% (15/206)
2	<i>Brown v. Bd. of Educ. of Topeka</i>	1954	347 U.S. 483	1.5% (3/200)
3	<i>Griggs v. Duke Power Co.</i>	1971	401 U.S.424	3% (8/270)
4	<i>Frontiero v. Richardson</i>	1973	411 U.S. 677	5.8% (18/308)
5	<i>Roe v. Wade</i>	1973	410 U.S. 113	10 % (127/1265)
6	<i>Washington v. Davis</i>	1976	426 U.S. 229	16% (80/499)
7	<i>Califano v. Webster</i>	1977	430 U.S. 313	3.7% (6/164)
8	<i>Craig v. Boren</i>	1977	429 U.S. 1124	20.6 % (90/436)
9	<i>Dothard v. Rawlinson</i>	1977	433 U.S. 321	20.7% (50/242)
10	<i>L. A., Dep't of Water & Power v. Manhart</i>	1978	435 U.S. 702	4.6 % (16/347)
11	<i>Akron v. Akron Ctr. for Reprod. Health, Inc.</i>	1983	462 U.S. 416	1.9% (12/632)
12	<i>Barefoot v. Estelle</i>	1983	463 U.S. 880	33.9% (209/616)
13	<i>Bowers v. Hardwick</i>	1986	478 U.S. 186	0% fn #2 dissent- 4 lines
14	<i>Cal. Fed. Sav. and Loan Ass'n v. Guerra</i>	1987	479 U.S. 272	0%- heavy reliance on congressional reports
15	<i>McCleskey v. Kemp</i>	1987	481 U.S. 279	27% (200/742)
16	<i>Richmond v. J. A. Croson Co.</i>	1989	488 U.S. 469	8.3% (97/1175)
17	<i>Hodgson v. Minnesota</i>	1990	497 U.S. 417	11.2 % (95/846)
18	<i>Planned Parenthood of Southeastern Pa. v. Casey</i>	1992	505 U.S. 833	4.6 % (94/2030)
19	<i>Daubert v. Merrell Dow Pharm., Inc.</i>	1993	509 U.S. 579	57.2% (243/425)

TABLE 3. PERCENT DIFFERENCES FOR INCLUDED CASES IN CHRONOLOGICAL ORDER BY CASEBOOK SERIES.

Case Name	Original %	Dowling / Gunther (15 eds)	Lockhart (8eds)	Stone (4eds)	Kay (4eds)
<i>Muller v. Oregon</i>	7.3	-7.3, -7.3, -7.3, +3.2, +3.3, +3.4, +7.4, +3.1, +6.2, -7.3, -7.3, -7.3, -7.3, -7.3, -7.3	-7.3, -7.3, -7.3, -7.3, -7.3, -7.3, -7.3, -7.3	-7.3, -7.3, -7.3, -7.3	+5, -7.3, -7.3, -7.3
<i>Brown v. Board of Educ. of Topeka</i>	1.5	0,0,0,0,-3, -3, -1, -3, =, +1, +2, +1, +2, +2, +2	+1, +1, -3, +1, +9, +1, +2	+1, -1.5, +9, +9	0,0,0,0
<i>Griggs v. Duke Power Co.</i>	3	0,0,0,0,0,0,0, -3, +19.7, -3, -3, 0, 0, 0	0,0,0,0,0,-3, 0,0	0,0,0,0	+2, -2, +7, +7
<i>Frontiero v. Richardson</i>	5.8	0,0,0,0,0,0,0, -2.5, -5.8, -1.9, -2, -2, -1.9, -1.8	0,0,0,-2.3, -1.1, -1.7-1.1, 0	-2, =, +8, +1	-3,-3.1, -2.8, -2.6
<i>Roe v. Wade</i>	10	0,0,0,0,0,0,0, -3.3, -3.1, -4, -4.6, -4.5, -2.3, -3.4	0,0,0,-2.2, -1.9, -9,-5, -4	-1.6, -9, -1.8, -1.5	-6.8, -6.5, -10, -5.8
<i>Washington v. Davis</i>	16	0,0,0,0,0,0,0, 0, -.5, 0, -11.2, -9.7, -9.8, -9.9	0,0,0,-4.4, +9, =, -9.6,-8.6	-4.3, -2.2, -2.7, -3.2	0, -7.7, -7.2, -7.4
<i>Califano v. Webster</i>	3.7	0,0,0,0,0,0,0, 0, -3.7, -3.7, -3.7, -3.7, -3.7, -3.7,	0,0,0,0,-3.7, -3.7, -3.7, -3.7	-3.7, -3.7, -3.7, -3.7	0, +2.2, 0,0
<i>Craig v. Boren</i>	20.6	0,0,0,0,0,0,0,0, +37.8, +40.8, +40.9, +28, +32.3, +32.3	0,0,0,+31.1, -6.8, -5.2, -5.2, +14	+14.1, +29.4, +28.1, +32.5	0, +14.9, +31.8, +27.9
<i>Dothard v. Rawlinson</i>	20.7	0,0,0,0,0,0,0, 0, 0, 0, 0, 0, 0	0,0,0,0,-20.7, 0,0,-19.8	0,0,0,0	0, -9, -8.7, -13.1

TABLE 4. SUMMARY TABLE OF WITHIN CASEBOOK SERIES CHANGE DYNAMICS

Case Name	Official opinion %	Dowling / Gunther (15 eds)	Lockhart (8eds)	Stone (4eds)	Kay (4eds)
Muller v. Oregon	7.3	*9 decreases 6 increases	*8 decreases	*four decreases	*3 decreases 1 increase
<i>Brown v. Bd. of Educ. of Topeka</i>	1.5	** 4 decreases 6 increases	** 1 decrease 6 increases	** 1 decrease 3 increases	
<i>Griggs v. Duke Power Co.</i>	3	*3 decreases 1 increase	*1 decrease		**1 decrease 3 increases
<i>Frontiero v. Richardson</i>	5.8	*7 decreases	*4 decreases	**1 decrease 2 increases	**4 decreases
<i>Roe v. Wade</i>	10	*7 decreases	*5 decreases	*4 decreases	*4 decreases
<i>Washington v. Davis</i>	16	*5 decreases	*3 decreases 1 increase	*4 decreases	*3 decreases
<i>Califano v. Webster</i>	3.7	*6 decreases	*4 decreases	*4 decreases	**1 increase
<i>Craig v. Boren</i>	20.6	**6 increases	3 decreases 2 increases	**4 increases	**3 increases
<i>Dothard v. Rawlinson</i>	20.7		*2 decreases		*3 decreases
<i>L. A., Dep't of Water & Power v. Manhart</i>	4.6	*2 decreases	*3 decreases		*3 decreases
<i>Akron v. Akron Ctr.r for Reprod. Health</i>	1.9	2 decreases 2 increases	2 decreases 1 increase	*4 decreases	**1 increase
<i>Barefoot v. Estelle</i>	34.6				
<i>Bowers v. Hardwick</i>	0 dissent fn #2				
<i>Cal. Fed. Sav. and Loan Ass'n v. Guerra</i>	0- in legis intent				
<i>McCleskey v. Kemp</i>	27		**2 increases	**1 increase	*1 decrease
<i>Richmond v. Croson</i>	8.3	2 decreases 2 increases	1 decrease 1 increase	1 increase	1 decrease
<i>Hodgson v. Minnesota</i>	11.2	*2 decreases	*1 decrease 1 increase	*3 decreases	*1 decrease

<i>Planned Parenthood of Southeastern Pa. v. Casey</i>	4.6	**3increases	**1 increase	*2 decreases	*1 decrease
<i>Daubert v. Merrell Dow Pharm., Inc.</i>	57.2				

* generally declining inclusion (32 instances)

** generally escalating inclusion (15 instances)

No asterisk indicates fluctuating percentages with no discernible trend going up or down.