# Chapter 5

Teaching the Benefits and Limits of Human Classification and Machine Algorithms: Theory and Practice

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An end goal of teachers in every discipline, whether explicit or not, is that students will achieve the ability to transfer the analytic processes and methods learned to solve one problem to solve another, different problem. In other words, teachers hope to teach students metacognitive skills, so the student can be aware of patterns and schema and apply them to new scenarios.<sup>1</sup> In the realm of legal research resources, because they change so quickly, it is not sufficient to teach students how to use the interface or resources? they see today. The interface will be different tomorrow. One legal publisher will be purchased by another. The format for accessing a particular resource will change. A tool available online in law school might only be available in print at the work place. So we need to teach our students how to think about searching in a way that will enable them to transfer those skills to whatever current or future search environment they encounter. In an environment with so many choices of databases and legal resources, it is not sufficient merely to teach law students how to use the existing interfaces. We need to teach our students to understand the research environment that produced

<sup>&</sup>lt;sup>1</sup> There are many different meanings of metacognition, from the philosophical statement that "metacognition is thinking about thinking" to more a knowledgebased definition, where metacognition is seen as "the ability to assess, not only the result, but the schemata, including the processes leading to the result. It is a kind of self-awareness and reflection of the research experience." Paul D. Callister, *Time to Blossom: An Inquiry into Bloom's Taxonomy as a Means to Ordered Legal Research Skills*, 102 LAW LIBR. J. 191, 194–95, 210 (2010).

their results and to analyze their search results accordingly, so that they can refine and iterate the research process to completion.

One method of helping legal researchers conceptualize the use of research resources in such a way that the lessons are applicable in numerous situations is to focus on evaluating the benefits and detriments of both human-assisted and computer-assisted search. When a researcher understands that a research resource is using mainly human-assisted features, and knows what to expect when human-assisted features are involved, that translates across resources. The same is true if the question is what to expect when using a resource's computer-assisted features. When a researcher understands the differences that different algorithms and different search features makes, and can think about the ways that a particular method of searching online might affect the results of the search, that also translates across resources. If researchers can ask and answer these questions, they can decide how to use any research resources more effectively and know when they have reached the limits of a particular search method. Then the researcher can rethink the problem, and move on to another technique. The discussion of human versus machine search features goes far beyond any debate about the value of using books versus the value of online search. There is little more human-centered than library catalog subject entries, but library catalogs are accessed online. Human-generated finding aids abound in the online world: indexes, subject headings, Key Numbers in Westlaw, and tables of content are primarily generated by humans, but are a feature of the online as well as the print environment. Computergenerated search results include natural language searching, some variation of which power most search engines these days, from Westlaw and Lexis to Google, but whose logic and underlying assumptions are hidden from searchers.<sup>2</sup> The world of legal search is a hybrid world. Rarely is the divide perfect. Boolean searching in full-text databases has generally been considered a computer-assisted search mode. But in today's search environment, Boolean searching is actually transparent. Because Boolean (or terms and connectors) searching involves a person

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telling a computer exactly what to do, and because the computer strictly responds to those commands, I would put Boolean searching on the human-generated side. This illustrates both the imperfection of the divide, and the fact that the continuum between humans and the machines they use is a moving target

Algorithms assist human-generated search functions, and humans assist primarily algorithmically-generated searches. The question for legal researchers in our hybrid world becomes: what or who is more in control of the search: humans (with all their failings) or algorithms (that the researcher cannot understand)? Focusing on control, and positing the human researcher as a major player along the human/machine continuum also blurs the lines between another method of distinguishing research systems, which is as intermediated or human-assisted systems and disintermediated or computer-run systems.<sup>3</sup> Researchers need to learn to understand which side of the human/machine continuum they are on, and to understand the effects of being on a human/machine continuum. This needs to be taught and learned both theoretically and experientially.

Introducing the human/machine theme early and reiterating it often during the course of a class, across a number of legal resources, should gradually train students to transfer information learned in one problem set to any other domain; this situation transfer of basic principles to a continuously changing problem is "far transfer,"<sup>4</sup> to an end goal: being aware, during the research process, of the benefits and detriments of the resources being used is a part of metacognition. This chapter explores how the theory and the experience work when teaching the use of the headnote as a central component of in-depth case research.

To get to the end goal, metacognition, legal researchers need to pass through more than one stage of cognitive learning. One schema for addressing the stages of cognitive learning is Bloom's taxonomy,<sup>5</sup>

<sup>&</sup>lt;sup>2</sup> For a discussion of the impact on perceived reality created by the hidden nature of the computer technologies that humans navigate, see Julie Cohen, *Configuring the Networked Citizen, in* MANAGING NEW LEGALITIES: PRIVACY AND POSSIBILITIES IN THE 21ST CENTURY, 130–32 (Austin Sarat, Laurence Douglas & Martha Merrill Umpfhrey eds., 2012).

<sup>&</sup>lt;sup>3</sup> See, e.g., Paul D. Callister, *Thinking Like a Research Expert: Schemata for Teaching Complex Problem-Solving Skills*, 28 LEGAL REF. SERV. Q. 27, 31 (2009).

<sup>&</sup>lt;sup>4</sup> Sarah Valentine, Legal Research as a Fundamental Skill: A Lifeboat for Students and Law Schools, 39 U. BALT. L. REV. 173, 223–24 (2009).

<sup>&</sup>lt;sup>5</sup> Lorin W. Anderson & David R. Krathwohl, A TAXONOMY FOR LEARNING, TEACHING, AND ASSESSING (2001). Bloom was recognized as a major figure in learning theory, who believed every discipline should have its own taxonomy: "Ideally each major field should have its own taxonomy in its own language—

which has been adapted to teaching legal research.<sup>6</sup> To simplify the structure of Bloom's adapted taxonomy, the six stages are: remember, understand, apply, analyze/synthesize, resolve, and metacognition.<sup>7</sup> At each stage, there are appropriate learning tasks for legal research. Bloom's adapted taxonomy fits into the Boulder Statement's signature pedagogy.<sup>8</sup> One part of that signature pedagogy—the surface structure—is meant to move students through these stages of learning:

We teach an intellectual process for the application of methods for legal research by: ... Using a range of teaching methodologies and a mix of realistic problem types; ... Showing the relationship of legal structure to legal tools and evaluating the appropriate use of those tools; ... Inculcating the practice of iterative research strategies; and ... Providing regular assessment.<sup>9</sup>

That surface structure "enables students to master analytic and metacognitive approaches to" larger problems.<sup>10</sup> The surface struc-

more detailed, closer to the special language and thinking of its experts, reflecting its own appropriate sub-divisions and levels of education, with possible new categories, combinations of categories and omitting categories as appropriate." *Id.* at xxyii–xxviii.

<sup>6</sup> Callister, *supra* note 1, at 200.

<sup>7</sup> Id.

<sup>8</sup> BOULDER STATEMENT ON LEGAL RESEARCH EDUCATION, Appendix A, *infra* p. 255; BOULDER STATEMENT ON LEGAL RESEARCH EDUCATION: SIGNATURE PEDAGOGY, Appendix B, *infra* p. 261, and the BOULDER STATEMENT ON LEGAL RESEARCH EDUCATION: COACH TEMPLATE, Appendix C, *infra* p. 267 ["Boulder Statements"].

<sup>9</sup> The *Signature Pedagogy's* surface structure in full is: "We teach an intellectual process for the application of methods for legal research by: ... Using a range of teaching methodologies and a mix of realistic problem types; ... Showing the relationship of legal structure to legal tools and evaluating the appropriate use of those tools; ... Inculcating the practice of iterative research strategies; and ... Providing regular assessment." While the pedagogy does not precisely follow the six stages of Bloom's taxonomy, the elements of legal research's signature pedagogy allow students to move through the six stages of Bloom's taxonomy.

<sup>10</sup> The *Signature Pedagogy's* deep structure in full is: "The surface structure above enables students to master analytic and metacognitive approaches to: ... Find and evaluate sources in the context of the legal questions; ... Determine legal context, access authority, and understand how what is found relates to the legal question; and ... Synthesize knowledge of the legal resources and institutional

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ture's framework allows movement through the adapted Bloom's taxonomy for legal research from remembering to metacognition.

The surface structure for legal research pedagogy includes "showing the relationship of legal structure to legal tools and evaluating the appropriate use of those tools." Here, headnotes in cases are the vendor provided, value-added legal tools embedded in the output of the judicial branch. Each headnote is the center of a research universe. Each headnote allows the researcher to find cases that on the headnote topic, though the use of citators and the digesting functions embedded in the cases that both Lexis and Westlaw publish online and in print. Bob Berring has called using headnotes as jumping off points as an important part of the "one good case" method.<sup>11</sup> If a researcher can find just one good case, the case is an access point into many, many legal research resources. But law students have traditionally had problems understanding headnotes and their relationship to citators and digests.

# Remembering

Headnotes can be used to illustrate the human/machine divide. But before students can understand headnotes on this level, they should be introduced to the history of digests and citators, so they can *remember*<sup>12</sup> why headnotes exist and might be important.

The history of headnotes and their use is engaging. John B. West started West Publishing Company with the mission of publishing every case in every jurisdiction in the country in a series of regional case reporters.<sup>13</sup> It was called the National Reporter System. In the

structures to implement research design, and evaluate and communicate the results.

<sup>11</sup> See Jill Anne Farmer, A Poststructuralist Analysis of the Legal Research Process, 85 LAW LIBR. J. 391, 404 (1993): Bob Berring, for example, in his videotape series "Commando Legal Research" (Legal Star Communications, 1989) advocates as a smart research tactic finding "one good case," and locating the topic and key number for the case to find citations for similar decisions. He also recommends checking annotations and looseleaf services for citations to law review articles that have already set out the relevant issues and legal reasoning (albeit in traditional modes of analysis).

<sup>12</sup> The first stage in Bloom's taxonomy. See Callister, supra note 1, at 199.

<sup>13</sup> Ross E. Davies, *How West Law Was Made: The Company, Its Products, and Its Promotions,* 6 CHARLESTON L. REV. 231, 234 (2012).

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1890s, West Publishing editors began creating headnotes in cases and assigning each headnote to a tiered classification of the law.<sup>14</sup> The arrangement of the headnotes into a classification of the law allowed West to publish topical digests of cases, called the American Digest System, so that a lawyer could look up any headnote subject and find other cases on that topic. This is what West Publishing had to say about its classification system in 1896:

What the National Reporter System has done in the field of reporting.

the American Digest System has done in the field of digesting. This System covers the whole field of American judicial precedents,-and it is the only enterprise which undertakes to do so. The Century Edition, in one series of fifty volumes, gives a systematic digest of all law points in all reported American cases from the earliest times down to 1896, under one alphabetical arrangement of subjects.<sup>15</sup>

In the current West system, human editors<sup>16</sup> take the legal concepts from a case, summarize the concept in the editor's own language,<sup>17</sup> and link the resulting headnote with the appropriate Key Number in the West Digest classification system.<sup>18</sup> West's Digest's are "basically compiled subject arrangements" of the West's headnotes.<sup>19</sup> The subjectbased hierarchies of the West Digest system have been evolving since the late-nineteenth century,<sup>20</sup> and the law is now fitted into 414 main Mart, Benefits and Limits of Human Classification

topics,<sup>21</sup> and more than 40,000 subtopics.<sup>22</sup> So headnotes in the West system take a legal researcher directly into a topical research system.

In the late nineteenth century, Frank Shepard had another idea about dealing with the unprecedented proliferation of cases.<sup>23</sup> It is worth noting that the nineteenth century proliferation of cases was counted in volumes and that commentators lamented the sheer quantity: "In 1839, the American reports alone, exclusive of digests and treatises, were estimated at five hundred and thirty-six."<sup>24</sup> An 1839 volume of the Maryland Reports has 88 cases in it. To generalize from this volume and a few others.<sup>25</sup> in 1839 there might have been as many as 68,000 state and federal cases that Mr. High was complaining about.<sup>26</sup> Today, West has about 11 million cases in its case databases, and adds 350,000 a year.<sup>27</sup> Lexis also has about 11 million cases in its case databases.<sup>28</sup> That puts the problem of finding relevant cases in perspective.

Mr. Shepard's idea for dealing with the proliferation of cases focused on keeping track of the status of a case. How did later courts deal with the wonderful case the legal researcher might have found? In the early days, when there were not as many cases, lawyers who received a report of a case that cited a case relevant to the lawyer's practice went over to the bookshelf, picked up the volume holding the

<sup>&</sup>lt;sup>14</sup> *Id.* at 234–35.

 $<sup>^{15}</sup>$  Id. at 271.

<sup>&</sup>lt;sup>16</sup> Ed Walters of Fastcase has called Westlaw's use of humans to read and annotate cases a "relic, an anachronism from the age of print ... they're acting as if search engines never existed." Paid Content: The Economics of Digital Content. Bloomberg's big bite for billions of legal dollars, Jeff John Roberts, Jun. 4, 2012. http://paidcontent.org/2012/06/04/bloombergs-big-bite-for-billions-of-legal-dollars.

The "editor's own language" does sometimes parallel the exact language of the court, but West editors are free to, and do, summarize legal concepts in their own words.

<sup>&</sup>lt;sup>18</sup> MORRIS L. COHEN, ROBERT C. BERRING & KENT C. OLSON, HOW TO FIND THE LAW 84 (9th ed., West 1989).

<sup>&</sup>lt;sup>19</sup> Id.

<sup>&</sup>lt;sup>20</sup> Id.

<sup>&</sup>lt;sup>21</sup> WEST'S ANALYSIS OF AMERICAN LAW, xv-xvii (ThomsonWest 2011).

<sup>&</sup>lt;sup>22</sup> F. Allan Hanson, From Key Numbers to Keyword: How Automation Has Transformed the Law, 94 LAW LIBR. J. 563, 568 (2002).

<sup>&</sup>lt;sup>23</sup> In the mid-nineteenth century, citators as a concept were a response to the growing body of case law. Patti Ogden, Mastering The Lawless Science of Our Law: A Story of Legal Citation Indexes, 86 LAW LIBR. J. 1 (1993).

<sup>&</sup>lt;sup>24</sup> J.L. High. What Shall Be Done with the Reports?, 16 AM. L. REV. 429, 430

<sup>(1882).</sup> <sup>25</sup> 10 Maryland Reports (Gill and Johnson) (1841) has 88 cases for 1839; 39 10 Maryland Reports (Gill and Johnson) (1841) has 88 cases for 1839; 39 Massachusetts Reports (22 Pickering) has 188 cases for 1839; 38 United States Reports (13 Peters) has 104 cases for 1839.

<sup>&</sup>lt;sup>26</sup> Taking the average of the reports (380/3), and multiplying the result (127) by 536 volumes (68,072).

<sup>&</sup>lt;sup>27</sup> Email from Jeff Brandimart, Academic Account Manager, Thomson/ Reuters, June 15, 2012. Copy on file with the author.

<sup>&</sup>lt;sup>28</sup> Emails from Michael Morton, Regional Academic Manager, Rocky Mountain-Plains Region, LexisNexis, June 8, 2012 and June 21, 2012; copies on file with the author.

original case, opened it to the right page, and wrote the new case citation in the margin. Franks Shepard went one better than that; he started selling paste in stickers that fit the margins of a case reporter, with the new citing references printed on them.<sup>29</sup> In the early 1900s, Shepard's moved to a book format, and by the 1920s, the link between headnotes and case citations was complete. A researcher could look up a case in a Shepard's citator for a West Publishing regional reporter, and find out which cases had cited the original case on any relevant headnote.<sup>30</sup>

The next step for both the Key Number System and Shepard's was to go online, where they reside today. West added KeyCite as its citation-checking alternative to Shepard's in 1997.<sup>31</sup> Shepard's is only available on Lexis.<sup>32</sup> In 1999, Lexis started a retrospective headnote creation project for all of the cases in its case databases, with considerable help from algorithms, and created its own topical classification of the law, intended to compete with Westlaw's headnote and Key Number system.<sup>33</sup> So now both Lexis and Westlaw have online digesting and citator functions. But each of the systems were created in very different ways.

Telling the stories of John West and Frank Shepard may make the concept of headnotes easier to *remember*. The headnote is not an

<sup>31</sup> Elizabeth McKenzie, *New Kid on the Block: KeyCite Compared to Shepard's,* SUFFOLK U. L. SCH. FACULTY PUBLICATIONS. Paper 49, http://lsr. nellco.org/suffolk\_fp/49 (1999). Although the creation of headnotes is human-generated at this point in time, the process of matching the headnote of a target case with the language of citing cases is performed by computer algorithms. How TO FIND THE LAW, *supra* note 18, at 86, 90, 97. (KeyCite depends on "automation" or "computer programs" for headnote assignment).

<sup>32</sup> Citation Services: Shepard's<sup>®</sup> Citations Service, LexisNexis Total Practice Solutions (2012), http://law.lexisnexis.com/shepards.

<sup>33</sup>*The LexisNexis Timeline: Celebrating 30 Years of Innovation*, http://www. lexisnexis.com/anniversary/30th\_timeline\_fulltxt.pdf: LEXIS Search Advisor helps legal researchers create effective searches through the selection of terms from a practice area-based classification system of legal topics and is an alternative to searching the West Key Number System<sup>®</sup>. Mart, Benefits and Limits of Human Classification

abstract concept. It was conceived of as a way to solve a problem, and citators and digests similarly evolved as sophisticated finding tools.

# Understanding

Students must also be introduced to the theories inherent in humanassisted and machine-assisted searching, and recognize the benefits and detriments of each system, so they can *understand* why it makes a difference. Since West's headnotes and digests are created primarily by humans and Lexis's headnotes and digest functions are created primarily by computer algorithms, the two systems offer excellent points of comparison for the human-assisted and computer-assisted resource comparison.<sup>34</sup> There is an abundance of literature on both indexing and full-text searching to help explain the issues.

Indexing is one of the most valuable functions that humans add to legal resources. Few students have been introduced to the benefits of indexing. Indexing by humans involves:

a professionally trained indexer [who] reads or scans the text of each document to determine its content, then selects appropriate headings (names, places, subjects) to facilitate retrieval. Cross-references are made from synonyms, and the entries are arranged in the desired sequence (alphabetical, numerical, classified, etc.). ... content descriptors are usually selected from a list of preferred terms (controlled vocabulary), developed over time by the indexing service.<sup>35</sup>

Better results can be one of the benefits of using an index. In a 2008 study done by BNA, law students were given a series of research questions to answer in *United States Law Week*; half of the questions were to be answered using indexes and the other half were to be answered using full-text searching.<sup>36</sup> In the BNA Usability Study, index

<sup>36</sup> BNA Law School Education Series: Using Online Indexes, http://www.levtechinc.com/pdf/Using%20BNA%20Indexes%20study.pdf.

http://www.bna.com/uploadedFiles/Content/PDFs/Index\_Searching\_vs\_Full\_ Text%20Searching\_BNA\_Study\_2005.pdf

<sup>&</sup>lt;sup>29</sup> Ogden, *supra* note 23, at 29; the publication was known as Shepard's National System of Adhesive Annotations. *Id.* 

<sup>&</sup>lt;sup>30</sup> *Id.* at 34, 35.

<sup>&</sup>lt;sup>34</sup> Susan Nevelow Mart, *The Relevance of Results Generated by Human Indexing and Computer Algorithms: A Study of West's Headnotes and Key Numbers and LexisNexis's Headnotes and Topics*, 102 LAW LIBR. J. 221, 223–26 (2010).

<sup>&</sup>lt;sup>35</sup> Online Dictionary for Library and Information Science, http://www.abcclio.com/ODLIS/odlis\_i.aspx,visited 4/15/2012.

users had an 86 percent success rate while text searchers had only a 23 percent success rate. The study included both single answer and more complex research tasks. Results for the various types of tasks confirmed many limits of text searching. Text searching can be successful in locating proper names or an isolated piece of information involving very specific facts. According to BNA, for most legal research tasks, "using an index provides more relevant and complete results."<sup>37</sup> The study answers the question about why indexes work as follows:

Why Indexes Work—Human Input: Indexers are subject-matter experts who analyze and classify every piece of information in a publication. BNA indexes work because a person takes the time to consider the context and meaning behind the words in a document. All of the indexing for BNA's legal publications is done by attorneys.<sup>38</sup>

But many legal research teachers, in an effort to impress the importance of indexes on their students, give them research problems to solve where the answer is easy to find in an index. This makes using an index in the real world a frustrating experience for students, and masks the lessons to be learned from asking students to focus on both the benefits—you can frequently get better results where a human has put all the related concepts in one place—and the detriments—unless the index is organized in a way that resonates with the researcher's search terms and is consistent, the researcher may fail to find what is wanted. We have all suffered from using an index whose organizing principles are opaque, or whose human editors seem to reside in a different analytical world from the one the researcher currently inhabits. It does no good to hide these defects from students, who need an alternate strategy when the index fails. Regarding the most robust subject index for legal research, the Key Number System, Stephen M. Marx wrote:

Compilations of legal cases according to code numbers have been available since at least 1888. The most popular of these systems in use today is the West Key Number system. Any legal researcher will attest to the difficulty of using the *West General Digest*. The system is incredibly complex. There are, for example, at least four

<sup>37</sup> Id. <sup>38</sup> Id. Mart, Benefits and Limits of Human Classification

. . . .

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hundred (400) major classification headings, each with from sixteen (16) to two thousand (2000) subheadings....

There are four important drawbacks to systems based mainly on the use of key words and phrases: (1) these systems are static in their terminology and not adaptable to vocabulary changes; (2) these systems require that the user's thinking conform to the classifications formulated by the system designers; (3) these systems classify the law according to a rigid key word terminology without indicating the context in which the words appear; and (4) each of these systems is based on indexing and classifying that has been done by human

Key Numbers in particular have been criticized for being too conservative; it takes a long time for new concepts to get a new entry: "New ideas and theories are classified back into existing categories. New fields like civil rights law or feminist jurisprudence are broken apart and dropped into pre-existing categories."<sup>40</sup> The various facets on computer law and online privacy suffered the same fate.

One of the benefits of full-text searching is that it sets the researcher free from the constraints of the indexer's mind. Of course, it subjects the search to the limits of the researcher's mind. <sup>41</sup> One of the detriments of searching using keywords in full-text legal databases is

<sup>40</sup> Robert C. Berring, *Collapse of the Structure of the Legal Research Universe: The Imperative of Digital Information*, 69 WASH. L. REV. 9, 21 (1994). It takes West a long time to create new categories. *Id.* 

<sup>41</sup> Anton Geist, Using Citation Analysis Techniques for Computer-Assisted Legal Research in Continental Jurisdictions 19, LL.M. thesis, University of Edinburgh (2009), available at http://ssrn.com/abstract=1397674. One problem for inexperienced researchers seems to be a belief in the high quality of their research results. Novice searchers believe they have actually seen all the relevant documents and that the documents seen are the most relevant documents. Any legal research teacher can confirm this phenomenon.

<sup>&</sup>lt;sup>39</sup> Stephen M. Marx, *Citation Networks in the Law*, 10 JURIMETRICS J. 121, 122–23 (1970). Mr. Marx thought computer-generated systems based on key words alone would suffer from similar defects and proposed a context-based and citation-based retrieval system he characterized as a form of "exhaustive shepardization" assisted by a technique for "automatically isolating the factual content of a case" *Id.* at 125, 137. The article was written, of course, before Shepard's went online or KeyCite was launched.

the difficulty of retrieving all of the relevant documents.<sup>42</sup> This is the problem of recall and precision. It is, so far, an immutable rule of full-text searching that the more documents you retrieve in your search result that are relevant (high precision), the more relevant documents there are that the search failed to retrieve (low recall).<sup>43</sup> In fact, whether a researcher wants high precision or high recall will vary from search to search: for comprehensive research, a researcher may need every relevant document, while for a time-driven request, the user may want the system to return the documents that are most highly relevant first.

There are other problems associated with full-text searching, including the difficulty of crafting effective searches, the literalness of Boolean searching,<sup>44</sup> and the opacity of natural language searching.<sup>45</sup> Not understanding what is happening in a search—how the results are being ordered or returned, or, in many cases, what set of documents is being searched, means that the level of confidence in the utility of the result set will not be that high, for an expert researcher. And students do become expert researchers—being a competent lawyer depends on

<sup>43</sup> "Essentially, there are two conflicting standards for measuring the success of your research. Precision measures how many documents were on point within your search results. In contrast, recall gauges the relevant documents in your results compared to what you could have found." Paul D. Callister, *Working the Problem,* ILL. B.J., Jan. 2003, at 43, 44. The inverse relationship between precision and recall is "the universal principle of information science." *Id.* As far back as 1994, West's own study of the relationship between precision and recall in the Federal Supplement database showed that as precision went up, recall went down at almost the identical rate. *Id.* 

<sup>44</sup> Geist, *supra* note 41, at 15.

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it. Novice legal researchers need to understand that they are being manipulated by unknowns, and even by the design of the interface: "Every technology has an interface ... a place where you end and the technology begins." <sup>46</sup> Part of the job of the technology is to order the universe for the user, and the trend in legal databases is toward less human control for search functions.<sup>47</sup> Database design itself creates a its own perception of reality, as our interaction with the design affects our experience of the research process. Looking at the design of databases since their introduction, the design started by making searchers fish for relevant results in a sea of full-text cases, bereft of the framework that classification provides.<sup>48</sup> Classification was added to database design and so were links to suggested resources. The modern interface provided by WestlawNext and Lexis Advance promote searching unmoored from any sense of where the data comes from or how the search is constructed.

The difficulties imposed by database design or distrust of the completeness of a search using an unknown algorithm can be solved by using multiple resources. Redundancy in using legal resources is meant to solve the problem of any one resource failing to return all relevant results.<sup>49</sup> But redundancy as a search strategy needs to be taught. And

<sup>&</sup>lt;sup>42</sup> Whether finding *all* of the relevant documents is necessarily the holy grail of online research is an entirely different question. *See, e.g.*, Scott Burson, *A Reconstruction of Thamus—Comments on the Evaluation of Legal Information Retrieval Systems*, 79 LAW LIBR. J. 133, 136–139 (1987). Only some research problems will actually call for such an exhaustive approach.

<sup>&</sup>lt;sup>45</sup> The algorithms used by Lexis and Westlaw are trade secrets. *See, e.g.*, Julie E. Cohen, CONFIGURING THE NETWORKED SELF: LAW, CODE, AND THE PLAY OF EVERYDAY PRACTICE 209 (2012): "Efforts to gain access to information about the algorithms that determine the order of online search results have typically been stymied by assertions of trade secrecy...: The exact operation of a relevancy-ranked natural language algorithm is proprietary and usually not disclosed. *See also* Danny C.C. Poo & Christopher S.G. Khoo, *Online Catalog Subject Searching, in 2* ENCYCLOPEDIA OF LIBRARY AND INFORMATION SCIENCE 2218, 2224 (2003)

<sup>&</sup>lt;sup>46</sup> ELI PARISER, THE FILTER BUBBLE: WHAT THE INTERNET IS HIDING FROM YOU 13 (2011) (citing Ryan Calo).

<sup>&</sup>lt;sup>47</sup> The original user interfaces for both Lexis Advance and WestlawNext were very simple, and users were encouraged to do simple searches. The changes made by each provider since the implementation of the new interfaces have, however, been towards putting some of the complexity back in. WestlawNext and Lexis Advance, for example, have added back the ability to easily search one resource or database. Information about the contents of databases is slated for re-inclusion by both providers.

<sup>&</sup>lt;sup>48</sup> See, e.g., Robert C. Berring, Legal Research and the World of Thinkable Thoughts, 2 J. APP. PRAC. & PROCESS 305, 313–14 (2000) and Ellie Margolis, Authority Without Borders: The World Wide Web and the Delegalization of Law, 41 SETON HALL LAW REV. 909, 911–12, 923–24 (2011).

<sup>&</sup>lt;sup>49</sup> "So long as there are redundant systems in place that offer different methods of retrieval, no single system needs to be perfect. For example, case digests, legal encyclopedias, and citators ... all provide different methods for finding cases. No single system is perfect, but when used together they offer the researcher a good chance of finding all relevant legal authority on any issue." William R, Mills, *The* 

making search interfaces simpler and hiding more of the search process from researchers, as Lexis Advance and WestlawNext have done, may require more thought about redundancy in research than before, not less.<sup>50</sup>

In a hypothetical example, what will a researcher need to understand about the one good case method? Let us posit one good case, *Cohen v. California*.<sup>51</sup> Part of understanding legal research is knowing that redundancy is a natural part of the process. Redundancy requires the researcher not just to do a general keyword search in a one-stop database, but to understand how to look for law review articles, a practice guide, an ALR annotation and how to use a citator to check the continuing validity of a primary law citation or the status of a law review. In addition to using digest and citator functions, the entry of that case into WestlawNext will give our hypothetical researcher access to secondary source materials that might be relevant to the issue from Cohen that matters in our exemplar: understanding the limits of public offensive speech. In WestlawNext, applying several filters in KeyCite will bring the researcher to 1 SMOLLA & NIMMER ON FREEDOM OF SPEECH § 5:3: (the captive audience problem), where the researcher can get background, context, and citations to other important cases. In Lexis Advance, using language learned from the WestlawNext search, "captive audience" and date limiters yield a law review article titled Aesthetic Regulation and the Development of First Amendment Jurisprudence, which has a short review of "captive audience" jurisprudence.<sup>52</sup> There are multiple other avenues to consider, all of which should, eventually, get the researcher to a full understanding of the contours of the legal issue. One resource will not be sufficient; multiple resources will bridge the gaps left by the earlier resources.

<sup>50</sup> Of course, the marketing materials from Thomson/West and LexisNexis make it seem like one-stop researching is the goal. But in practice, it does not work.

<sup>51</sup> 403 U.S. 15 (1971).

<sup>52</sup> Darrell C. Mefnthes, *Aesthetic Regulation and the Development of First Amendment Jurisprudence*, 19 B.U. PUB. INT. L.J. 225 (2010). Note that this resource would not be found without knowing the term "captive audience." Mining one search for nuggets to further one's research is perfect example in and of itself of the value of iterative research.

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## Understanding as a Path to Metacognition

Redundancy is part of teaching researchers to "work the problem," as Paul Callister calls it.<sup>53</sup> Since the very design of the database interface affects learning and retention, <sup>54</sup> students need to think about and select the most appropriate search strategies for that database. The strategy for Google and the strategy for WestlawNext are not going to be the same. Each strategy selected will influence the next part of the process, in an iterative loop. A fully realized research plan involves recalibrating along the way:

This is referred to as *metacognition*, a level of thinking that involves active control over the process of thinking, planning the way to approach a task, monitoring comprehension, and evaluating the progress.<sup>55</sup>

Understanding the iterative nature of legal research is only part of what eventually leads to metacognition. Christof van Nimwegen's research shows that the interface that is being used can impede the path to metacognition.<sup>56</sup> When the interface is simple, and takes the cognitive load off the user, then researchers "neglect to look for underlying rules, processes and other information while this is in fact necessary in order to build stable knowledge structures (schemas and plans) that can also be applied in new situations."<sup>57</sup> It turns out to be better to have to work a little harder at gradually building up the skills needed to master tasks on a computer database than to have it handed to you on a platter: an easier user interface means less is stored in long term memory and is available to recognize ways to use old schemas to solve new problem

<sup>55</sup> Van Nimweger, *supra* note 54, at 8. <sup>56</sup> Id

Shape of the Universe: The Impact of Unpublished Opinions On the Process of Legal Research, 46 N.Y. L. SCH. L. REV. 429, 442 (2002).

<sup>&</sup>lt;sup>53</sup> Callister, *supra* note 1, at 205–06.

<sup>&</sup>lt;sup>54</sup> Christof van Nimwegen. "The Paradox of the Guided User: Assistance Can Be Counter-effective," SIKS Dissertation Series No. 2008–09. Utrecht University, March 31, 2008. In the preceding example, for instance, the design of the databases for this example limited the possibilities to explore. It would have been nice, for example, to be able to easily limit the Shepard's results by headnotes within secondary sources, but only keyword limiting was provided. That meant knowing the right keywords to use was crucial to getting to any relevant articles among the over 2000 law review articles in the Shepard's report.

<sup>57</sup> Id.

patterns.<sup>58</sup> Students will need to acknowledge the role that database design plays in legal research problem-solving.

If understanding the effect that database interface design has on research is one element of the online research process that students should be exposed to, then understanding the limits of opaque search algorithms is another. Search functions are becoming more opaque, not less opaque. Google is an example of opacity that looks open. Google not only uses a proprietary search algorithm, it uses fifty-seven specific signals to personalize each user's results.<sup>59</sup> New researchers need to be taught how to turn off personalization to see if they get different potentially more relevant results when Google is not guessing what is wanted. WestlawNext uses proprietary software that uses crowdsourcing as well as Key Numbers to assist in bringing back what it thinks are relevant results. Lexis Advance uses its own proprietary software to try and bring relevant results to the top. These results can be valuable assists in finding relevant case law, but like all algorithms, return a result set the researcher has no way of evaluating for recall or precision. The plethora of hidden biases in search algorithms may impede finding esoteric or little-used content,<sup>60</sup> among other problems.

In the world of legal digests, West's Key Number System—a human-generated system—is directly competing with the Lexis system which has two digesting-like functions: the primarily algorithm-assisted

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More Like This Headnote; and the Lexis Topoc classification links. In the world of citators, Shepard's uses humans to do the original review, but both Westlaw for KeyCite and Lexis for Shepard's use algorithms to link headnotes in a case to citing references.<sup>61</sup> Having students compare these functions illustrates the value-added that human indexing adds for digests, and starkly illustrates the fact that every computer algorithm creates a relatively unique result set for citators. Since most new researchers do not distinguish the results found by one search engine from the results found by another, this is also a valuable lesson. So students hopefully remember what headnotes are and how they originally came into being from the histories of John West and Frank Shepard, and they also know that there are nearly 11 million cases that they might need to sort through if they are going to use the important cases they found using a treatise or practice guide to find citing references-cases "that have only marginal value as support for an abstract proposition of law, [but] have great value in their application of the proposition to facts similar to or analogous to the facts of your own case."62

### Network Theory

Why would a researcher want to use a headnote at all? To put the use of citators and digests in context, it is about taming those millions of cases. Analogies to network analysis are helpful in illustrating the function of headnotes in a full-text database world. The work of Daniel Martin Katz in *Network Analysis and the Law* is illuminating for students; he has a three dimensional model of the growth of judicial citations in early federal case law that shows students exactly how cases start linking out from important supreme court decisions.<sup>63</sup> For a two-dimensional view of citation networks, here is a visualization of *Roe v. Wade*:<sup>64</sup>

<sup>&</sup>lt;sup>58</sup> *Id.* The notion of plan-based behavior is reminiscent of what Rasmussen (1983) referred to as knowledge-based attentive action, which uses internally formed mental models, demanding high workload. Display-based problem solving, on the other hand, uses information available on the interface to structure and guide problem solving. We call such information *externalized*.

Little WM [working memory] and LTM [long-term memory] involvement ensues, and only recognition, not recall, is needed for task performance. *Id* at 9.

<sup>&</sup>lt;sup>59</sup> PARISER, *supra* note 46, at 1–2. Pariser discusses Google searches done by two similar people, both female professionals living in the Northeastern United States, who searched on "BP" in 2010, when the Deepwater Horizon spill was underway. One got a lot of results about the environmental consequences of what was happening and the spill. The other one just got investment information and nothing about the spill at all. *Id.* 

<sup>&</sup>lt;sup>60</sup>See, e.g., Ronald E. Wheeler, *Does WestlawNext Really Change Everything? The Implications of WestlawNext on Legal Research*, 103 LAW LIBR. J. 359, 364–68 (2011), and Lee F. Peoples, *Testing the Limits of WestlawNext*, 31 LEGAL REF. SERV. Q.125, 127–30 (2012).

<sup>&</sup>lt;sup>61</sup> HOW TO FIND THE LAW, *supra* note 18, at 84. Although the creation of headnotes is human-generated at this time, the process of matching the headnote of a target case with the language of citing cases is performed by computer algorithms. Elizabeth M. McKenzie, *Comparing KeyCite with Shepard's Online*, LEGAL REF. SERV. Q., 1999, no. 3, at 85, 90, 97 (stating that KeyCite uses automation or "computer programs" for headnote assignment).

<sup>&</sup>lt;sup>62</sup> Douglas K. Norman, *The Art of Selecting Cases to Cite*, 63 TEX. B. J. 34, 3410 (2000).

<sup>&</sup>lt;sup>63</sup> Of course, the model also illustrates which cases were seminal to the early development of American jurisprudence, but the growth of cases attached to those

### **Illustration One**



This is what one case looks like, and it is a perfect illustration of the "one good case" theory of legal research. While some cases have only a few citations, and may not take the researcher far, cases like *Roe v. Wade* sit at a hub of cases that may be more helpful to a researcher's actual fact pattern. This graphic is similar to other things students have seen and understand, like airline hub maps, pictured below by the OPTE Project:<sup>65</sup>

important cases is the part of interest to the students. *Network Analysis and the Law*, http://www.slideshare.net/Danielkatz/network-analysis-and-law-introductory-tutorial-jurix-2011-meeting-vienna; the interactive model is at http://computational legalstudies.com/2010/02/11/the-development-of-structure-in-the-citation-network-of-the-united-states-supreme-court-now-in-hd/

<sup>64</sup> 410 U.S. 113 (1973), from James H. Fowler & Sangick Jeon, *The Authority* of Supreme Court Precedent, SOCIAL NETWORKS, Vol. 30, Issue 1, Jan. 2008. Permission to reproduce the image given by James H. Fowler, Professor of Medical Genetics and Political Science, University of California, San Diego.

<sup>65</sup> Copyright permission given by Chris Harrison, Carnegie Mellon University.

### **Illustration Two**



## Analyzing and Synthesizing

For an example of a comparison, take our exemplar case, *Cohen v. California*.<sup>66</sup> The two headnotes here are Lexis headnote 3 and Westlaw Headnote 9; both headnotes have identical language:

The mere presumed presence of unwitting listeners or viewers does not serve automatically to justify curtailing all speech capable of giving offense.

*Cohen* is an important case on the scope of offensive speech and of actions as speech—the defendant had walked through a California courthouse corridor wearing a jacket bearing the words 'Fuck the Draft' in a place where women and children were present and was arrested and convicted of a breach of the peace statute which prohibited disturbance of the peace by offensive conduct; the court held that the First and Fourteenth Amendments prohibited criminalizing the simple public display of the single four-letter expletive.<sup>67</sup> When students are asked to

<sup>&</sup>lt;sup>66</sup> 403 U.S. 15 (1971)

<sup>&</sup>lt;sup>67</sup> *Id.* at 26.

find digest entries using both West's Key Number and Lexis's More Like This Headnote, to compare the relevance of a set number of cases from the results sets from each system, and to note whether or not there are unique results. These findings are discussed, and the students can come to their own conclusion about whether or not the human editors at West make a difference. For my students the amazing thing is always that there are unique results. Then I show the students the results of a hundred case studies of the relevance of results, where it is clear, that across a broad spectrum of cases, that Key Numbers results are more relevant, but also that they are not comprehensive.<sup>68</sup> And that is an important lesson in itself: although the way the systems are configured matters, with a small advantage to the human curated system, the Key Number system does not return all of the potentially relevant cases. So no one system is complete, and more than one resource needs to be used to have a thorough research strategy. This fits into a broader discussion of how to compensate for the failure of any one system to supply complete results. It is not necessary for students or lawyers to have access to both Lexis and Westlaw when they have an understanding of how to expand one search by using more than one Key Number or More Like This Headnote topic, or moving to other good seed cases. Asking the students how to compensate for the failure of any one system to give complete results allows them to draw their own conclusions from their comparisons, and takes the students through two more stages of Bloom's adapted taxonomy: *apply* and *analyze/synthesize*.

When students are asked to make these comparisons across a wide range of resources—comparing full-text searching in treatises with print or online indexes and tables of content—indexes versus full-text searching for finding relevant law reviews—the use of annotated code indexes versus full-text searching—and the results of dissimilar algorithms on search results in citators—the lessons about the value (and problems with) human-assisted searches and the value (and problems with) computer-assisted searching become clear. One method of searching is not being privileged over another—the methods are intended to

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be complementary and to provide students with an alternative when they have reached the limits of one search strategy: each method of searching is itself a player in the range of legal resource tools that allow redundancy in legal research to overcome the inadequacy of any one legal resource.

One of the clearest examples of how different algorithms change the results of otherwise entirely similar searches is having students compare the results of headnote and jurisdiction-limited citator searches. There are similar headnotes or both Lexis and Westlaw in *Lawrence v. Texas.*<sup>69</sup> Here is the text of headnote 7 on Lexis:

The country's laws and tradition afford constitutional protection to personal decisions relating to marriage, procreation, contraception, family relationships, child rearing, and education. These matters, involving the most intimate and personal choices a person may make in a lifetime, choices central to personal dignity and autonomy, are central to the liberty protected by U.S. Const. amend. XIV. At the heart of liberty is the right to define one's own concept of existence, of meaning, of the universe, and of the mystery of human life. Beliefs about these matters could not define the attributes of personhood were they formed under compulsion of the State. Persons in a homosexual relationship may seek autonomy for these purposes, just as heterosexual persons do.

Here is the text of headnote 3 for the case on Westlaw:

Fourteenth Amendment accords constitutional protection to personal decisions relating to marriage, procreation, contraception, family relationships, child rearing, and education.

Although the length of each headnote differs, they both discuss the same legal principle, in the same factual matrix. When students compare the results found for each headnote, and discover the lack of substantial overlap in cases on this topic that cite *Texas v. Lawrence*, the fact that the algorithm makes the difference is quite clear. There is not actually very much overlap in the cases found in Shepard's and KeyCite results for these similar headnotes.<sup>70</sup>

<sup>&</sup>lt;sup>68</sup> The cases found by using Key Number were 62% relevant, while the cases found by using More Like This Headnote were 48% relevant. There were unique relevant cases found in each system. Susan Nevelow Mart, *The Case for Curation: The Relevance of Digest and Citator Results in Westlaw and Lexis*, at 34 (July 18, 2012). http://ssrn.com/abstract=2112574.

<sup>&</sup>lt;sup>69</sup> Lawrence v. Texas, 539 U.S. 558 (2003).

<sup>&</sup>lt;sup>70</sup> Mart, *supra* note 68, at 38 (study comparing the results of 100 cases found only 33% overlap in the cases in Shepard's and KeyCite results.)

The conclusion that the algorithm is driving the results and that each algorithm has its own logic is inescapable. The benefit of algorithms is that the computer is doing a lot of heavy lifting in the background; the detriment is that, not knowing how the algorithm works, a researcher cannot rely on it to provide everything that is needed. Knowing every algorithm, even those working in identical data sets, returns unique results will help researchers who thought that all algorithms were created equal and that finding a few relevant results is the end of the research process to comprehend the fact that there are limits to any one search.

Knowing that there are similar limits to the indexing and subject functions in human-assisted systems is equally important. This knowledge is essential for determining the types of resources that should be consulted for a research project, and the weight that should be given to any one set of results. In other words, this knowledge will help students in creating a research plan. Creating the plan is a step that may become internalized, for an expert searcher, and with the transfer of schema that will help students understand the interfaces and search functions they are using, whether in print and online, students can become expert searchers