Note

Statutory Diagrams

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We live in a republic of statutes, yet understanding those statutes has become so cognitively difficult that judges cannot properly interpret them, citizens cannot properly understand them, and legislatures cannot properly write them. This Note presents a new tool for reducing the cognitive difficulty of understanding and applying statutes: statutory diagrams. The Note presents the theoretical case for diagrams as well as empirical evidence from a randomized control experiment demonstrating diagrams’ efficacy. The Note also presents theoretical and empirical evidence for diagrams’ primary drawback: the risk of biasing the interpretation of an ambiguous statute.

This Note then explores how statutory diagrams could be utilized at each stage of a statute’s life, exploring the unique benefits and risks of each use. Both textualist and purposivist judges can use diagrams to better actualize the normative values underlying their interpretive theories. Agencies can diagram statutes they administer to better communicate the statutory scheme to those it governs. Legislatures can use diagrams as part of the drafting process to avoid drafting errors. Finally, legislatures could formally enact the diagrams into law.

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Introduction

We live in a “republic of statutes,”1 yet understanding statutory law is impossible for the citizens of that republic. Reading the dense text of a statute and translating it into cognizable rules is incredibly difficult. This difficulty makes knowing the law virtually impossible for the vast majority of citizens, something that should be gravely concerning for anyone committed to the rule of law. In fact, in recent years, this difficulty has become so great that it has made drafting error-free laws virtually impossible, something that should be gravely concerning for anyone committed to effective governance.

Why is statutory interpretation so hard? Though some of the difficulty springs from the legalese common to legislative writing, even statutes written in relatively plain English are not easily understood. The main reason for this difficulty is that a person cannot read just one section of a statute and understand exactly what it means. Statutory language can be fully understood only by reference to other sections within the statute, and these relationships between sections are often as or more important than the language of individual sections.

Sometimes these references are explicit in the language of the statute. Take, for example, the tax code, a particularly notorious example of this complexity. Section 63 of the Internal Revenue Code defines taxable income as “gross income minus the deductions allowed by this chapter

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(other than the standard deduction).” A committed interpreter would then read the rest of the chapter searching for the deductions it allows and follow any cross-references those deductions reference. They would find that Section 63 refers to a personal exemption in Section 151, which in turn refers to a separate exemption for dependents, which is defined in Section 152. Though tractable, following this trail of legislative bread-crumbs is no trivial task for a tax lawyer, let alone a citizen trying to pay their taxes.

More frequently, though, these cross-references are not explicit, further complicating the task of understanding them. The meaning of a word or phrase in a statute can only be fully understood in the context of the whole act. This whole act canon implies a number of other cross-referential rules for interpreters to follow, such as the presumptions of consistent usage and meaningful variation, the rule against superfluities, and the harmonious-reading canon. All these contextual canons require a dedicated interpreter to understand an entire statute to understand any part of it. While scholars have begun to question whether courts ought to employ all derivatives of the whole act canon, it continues to be embraced by courts.

Purposivists, who believe statutes should be interpreted to advance their purpose, so long as that interpretation does not give the words a meaning they will not bear, believe the need to look at the whole act

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3. Id §§ 63(b), 151.
4. Id §§ 151(c), 152.
6. A word or phrase typically has the same meaning throughout a statute. See Gustafson v. Alloyd Co., 513 U.S. 561, 570 (1995); SCALIA & GARNER, supra note 5, at 170-73.
7. When different words are used throughout a statute, they typically mean different things. See, e.g., Chisom v. Roemer, 501 U.S. 380, 412-13 (1991) (Scalia, J., dissenting) (arguing that the use of “candidate” in some sections and “representative” in others shows that representative does not refer to all elected officials); SCALIA & GARNER, supra note 5, at 170-73.
8. This is the rule that provisions should not be read in ways that render them redundant. See SCALIA & GARNER, supra note 5, at 174-79.
9. The provisions of an act should be read to work together, and not in contradiction. See id. at 180-82.
11. See id. at 937; see also Victoria Nourse, Picking and Choosing Text: Lessons for Statutory Interpretation from the Philosophy of Language, 69 FLA. L. REV. 1409, 1430 (2017) (“No modern textualist, nor any modern purposivist, rejects the whole text.”).
transcends these contextual canons. Because understanding a statute’s purpose often requires a higher-level, structural analysis of the statute—that is, analyzing how the various rules and sections of a statute work together to create a regulatory scheme to address some problem—the whole act must be considered to discover the statute’s purpose. Further increasing the difficulty of this interpretive task, purposivists also suggest referring to external sources, such as legislative history, to discover a statute’s purpose.

Though none of these challenges make statutory interpretation completely intractable, they enormously increase the task’s cognitive difficulty. The cognitive load required to understand something increases with both the number of elements it includes as well as the number of relations between those elements. Cross-references in a statute, whether explicit or implicit, increase both the number of elements and the number of relations between those elements required to understand that statute. Because cognitive resources are not unlimited, people often subconsciously conserve them. This means that the high cognitive load required to properly interpret statutes may prevent people—be they judges, agency officials, lawyers, citizens, or legislators—from doing so. This difficulty also contributes to drafting errors, making the interpretive enterprise even more difficult before the statutory ink is dry.

This Note advocates for the use of a novel tool for making statutes more easily understandable: visual diagrams, such as flow charts, outlining a statute’s rules and structure. This Note presents the statistically significant results of an original experiment demonstrating that statutory diagrams decrease the cognitive difficulty of understanding and applying a statute. Specifically, the experiment showed that subjects applied a statute accurately 10% more often when they had a diagram than when they did not. This cognitive benefit makes statutory diagrams a tool worth using at every stage of a statute’s life. However, statutory diagrams do present some risks; in particular, a second original experiment demonstrates that diagrams have the potential to bias the interpretation of an ambiguous statute.

Despite this downside risk, diagrams have enormous potential as a practical tool at each stage of a statute’s life. These diagrams can improve

15. See id. at 671 (discussing how heuristics are one manifestation of people avoiding unduly high cognitive costs). For a list of reviews of the empirical evidence of the biases that result from conserving cognitive costs, see id. at 670-71.
16. The results had a p-value less than .01. See infra Section II.A for more details.
statutory interpretation in the judiciary. They can help textualist judges do textualism better by making it easier to interpret the text in its full context. And they can help purposivist judges do purposivism better by making it easier to discover a statute’s purpose and integrate it into the more concrete rules laid down by the statute. As textualism and purposivism are the two dominant theories of statutory interpretation, diagrams have the potential to become an interpretive tool embraced by a majority of judges.

Statutory diagrams can also be useful outside the judiciary. Diagrams can be created by agencies to better communicate the law’s requirements to the citizens governed by it. Agencies are already tasked with communicating and clarifying statutory rules to the public. But these regulations are often just as difficult to understand as the statutes themselves, imposing a high cognitive load in all of the same ways. More easily understood statutory diagrams could be an improvement over long textual explanations of how a statute works.

Finally, diagrams can be used by the legislature to avoid drafting errors. As recently demonstrated in *King v. Burwell*, seemingly minor drafting errors can be the undoing of major legislation, such as the Affordable Care Act (ACA). Diagrams’ potential to prevent these errors is extremely important, particularly in the age of unorthodox lawmaking where drafting errors are increasingly common. Due to these substantial upsides, this Note advances the thesis that this novel tool can and should be used at all stages of a statute’s life: for drafting, implementation, and interpretation.

Part of the reason statutory diagrams are currently unused is that visual media generally are remarkably underused in the law. Diagrams have long been theoretically and empirically studied and used in other fields, but the study of diagrams and other visuals in the law has a much shorter history. Law has historically been verbally and textually driven. As Professor Rebecca Tushnet puts it, the way law thinks about images is that “it doesn’t think much about them at all.” Practicing lawyers also have been hesitant to integrate images into their written work, preferring to explain abstract ideas in words. This disinterest has recently started

22. See RICHARD POSNER, REFLECTIONS ON JUDGING 143 (2013).
to change, albeit slowly, in both legal practice\textsuperscript{23} and the academy.\textsuperscript{24} This Note contributes to the burgeoning literature on visuals in the law by exploring a new visual interpretive tool and by contributing empirical evidence supporting that tool.

Although diagrams are a novel tool for statutory interpretation, I cannot claim to be the first person to notice their potential value in understanding the law. A recent article by Hillary Burgess advocates for law professors to use diagrams to teach legal doctrine.\textsuperscript{25}

However, there is no existing empirical work about the use of visuals to improve understanding of the law. This Note seeks to begin to fill that gap. In doing so, I hope to begin to catch the law up to other fields, which have already empirically established that diagrams aid in understanding biology,\textsuperscript{26} computer algorithms,\textsuperscript{27} mechanical systems,\textsuperscript{28} logical syllogisms,\textsuperscript{29} and more recently, philosophical arguments.\textsuperscript{30}

This Note proceeds as follows. Part I discusses the cognitive theory explaining why diagrams make statutes more understandable. Part II pre-

\begin{thebibliography}{9}

\bibitem{24} See, e.g., Hillary Burgess, Deepening the Discourse Using the Legal Mind’s Eye: Lessons from Neuroscience and Psychology that Optimize Law School Learning, 29 QUINNIPIAC L. REV. 1 (2011) (suggesting that professors use diagrams to teach legal doctrine); Elizabeth G. Porter & Kathryn A. Watts, Visual Rulemaking, 48 ENVTL. L. REP. 10,698 (2018) (discussing the use of visuals in developing, critiquing, and supporting federal regulations); Tushnet, supra note 21 (discussing images in copyright law); Stephen M. Judge, Note, Codex Imaginarius: Visual Codes in Land Use Planning and Aesthetic Regulation, 81 NOTRE DAME L. REV. 1595 (2006) (analyzing the push to include images in land use codes).

\bibitem{25} Burgess, supra note 24.

\bibitem{26} See Kirsten R. Butcher, Learning from Text with Diagrams: Promoting Mental Model Development and Inference Generation, 98 J. EDUC. PSYCHOL. 182, 190 (2006); see also Laura Perini, Diagrams in Biology, 28 KNOWLEDGE ENGINEERING REV. 273, 274-76 (2013) (discussing why biologists use diagrams instead of other visual communications).

\bibitem{27} See David A. Scanlan, Structured Flowcharts Outperform Pseudocode: An Experimental Comparison, 6 IEEE SOFTWARE 28 (1989).


sents empirical evidence that diagrams do in fact make statutes more easily understood. These parts also present the theory and empirical evidence underlying diagrams’ risk of biasing interpretation. Part III presents ways that statutory diagrams could be employed by the judicial, executive, and legislative branches, and discusses the benefits and drawbacks of diagrams for each use. Part IV briefly discusses some counterarguments. Part V concludes and highlights some of the open questions about statutory diagrams for future research.

I. The Theoretical Case for Diagrams

The overarching reason to believe diagrams will improve people’s ability to understand and apply statutes is that diagrams decrease the cognitive load required to process information. Diagrams do this by facilitating the creation of a mental “schema” of the statute through a variety of mechanisms. Once a person has a good mental schema of the statute, thinking about it requires fewer cognitive resources, freeing up cognitive capacity to think about how the statute applies to the specific situation. This Part will proceed as follows. First, I will present background information on cognitive load theory and learning. Second, I will discuss the mechanisms through which diagrams facilitate schema creation. Third, I will discuss how a schema, once created, enables better understanding, mental manipulation, and application of a statute, ultimately increasing interpreters’ accuracy. Finally, I will discuss why this theory creates the potential for diagrams to bias how a statute is interpreted.

A. Background on Cognitive Load Theory and Learning

Cognitive load theory explains how people understand and learn information based on humans’ cognitive architecture. Learning, according to cognitive load theory, is accomplished by holding a number of elements in “working memory” and manipulating them into a single “schema” that combines and organizes those elements. The key takeaway from this theory is that people have difficulty learning when cognitive


32. There is a third step, automation, which I will not discuss because it is not directly relevant to statutory diagrams. For information about it, see Sweller et al., supra note 13, at 256-58.
Whether it is because people are subconsciously conserving cognitive resources or because they simply do not have the cognitive capacity to process the information, when a person’s working memory is overwhelmed, they do not learn. To fully understand this theory, and its implications for statutory diagrams, some more background information on its key facets—working memory, schemas, and the relationship between the two—is needed.

Working memory is, in a word, consciousness. Things that a person is consciously thinking about are held in working memory; when they fade from working memory, the person is no longer actively thinking about them. While psychologists and neuroscientists disagree about the particular structure of working memory, there is widespread agreement that it is the cognitive system used for both temporarily storing and manipulating information. Importantly, both consciously holding a piece of information and manipulating it use working memory. That is, the same cognitive system is used to remember the letters “A” and “B,” and to put them in order.

Working memory has a limited capacity; people can consciously think about only so many things at the same time. In fact, it has a very limited capacity, with estimates ranging from approximately four to seven items. Importantly, because working memory is used both to consciously hold a piece of information and to manipulate it, working memory’s capacity is filled up by both the number of elements and the relationships between them. This means that the number of elements that can be held in working memory is smaller when those elements have to be processed, rather than simply remembered. To extend the alphabet example from above, if a person had a working memory capacity of

33. See Paas et al., supra note 31, at 1.
34. Sweller et al., supra note 13, at 252; see Nadine Marcus, Martin Cooper & John Sweller, Understanding Instructions, 88 J. EDUC. PSYCHOL. 49, 49 (1996).
36. See Alan Baddeley, Working Memory, 20 CURRENT BIOLOGY 136 (2010); Sweller et al., supra note 13, at 252.
37. See George A. Miller, The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information, 63 PSYCHOL. REV. 81 (1956); see also Nelson Cowan, The Magical Number 4 in Short-Term Memory: A Reconsideration of Mental Storage Capacity, 24 BEHAV. & BRAIN SCI. 87 (2000) (reviewing evidence that the capacity is even smaller than Miller posited).
38. See Cowan, supra note 37, at 87.
39. See Miller, supra note 37.
40. Sweller et al., supra note 13, at 252.
41. See id. at 252.
five elements, they could hold the letters “A,” “B,” “C,” “D,” and “E” in working memory. If they were also trying to process the order of the letters, they could hold the elements “A,” “B,” “A before B,” “C,” and “B before C.” When processing the ordering information, then, they would not have capacity to also consciously consider “D” and “E.” Thus, having to remember structure can impose an additional burden on the ability of an individual to work with information.

Working memory’s limited capacity presents a puzzle. How, if “[a]ll conscious cognitive activity learners engage in occurs in a structure whose limitations seem to preclude all but the most basic processes,” 42 has humanity achieved the intellectual feats it has? If working memory’s limits suggest people cannot consciously contemplate more than five to ten letters, how do we explain the existence of Hamlet, or more to the point, the ACA? 43

The answer comes from the concept of a schema. A schema “categorizes elements of information according to the manner in which they will be used.” 44 Once created, a schema can be accessed as a single unit in working memory, even if it combines multiple elements. 45 Schemas can also be created by combining and organizing existing lower-order schemas, allowing for the creation of incredibly complex schemas. 46 Thus, over time, letters can form schemas of words, words schemas of sentences, sentences schemas of simple concepts, and simple concepts schemas of complex ones. 47

However, forming these schemas is not costless. Schema construction requires manipulating information, and therefore taxes working memory. 48 This implies that when a task uses less working memory, there is additional capacity available to form schemas.

This is the central insight of cognitive load theory. It is more difficult to form schemas of information that requires lots of working memory to process (i.e., imposes a high “intrinsic cognitive load”), 49 whether caused by a large number of elements or a large number of relationships between those elements. 50 Similarly, it is more difficult to form schemas

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42. Id.
43. Id.
44. See Marcus et al., supra note 34, at 50. This process is also sometimes called “chunking.”
45. See id. at 255.
46. See Sweller et al., supra note 13, at 256 (noting that there is no limit on how complicated an element in working memory can be).
47. See id. at 255.
48. See id. at 259.
49. See id. at 259-62.
50. See Marcus et al., supra note 34, at 50.
when information is presented in a fashion that requires more working memory to process (i.e., imposes a high “extraneous cognitive load”).

Thus, generally, the lower the cognitive load, the more easily schemas are formed, and the better information is learned. But this generalization has a crucial exception. Presenting information in a way that is directed towards schema creation (i.e., imposes a “germane cognitive load”) aids learning even though it increases the cognitive load needed to process the information. There is nothing that can be done about reducing the intrinsic cognitive load of information; some information is simply complicated. The goal, then, to maximize understanding, is to present information in a way that minimizes extraneous cognitive load and imposes germane cognitive load. Diagrams, as discussed in Section I.B, do exactly that.

B. How Diagrams Facilitate Schema Construction

Diagrams are better than raw text at facilitating schema creation. Through a few different mechanisms, diagrams impose a smaller extraneous cognitive load and a more germane cognitive load.

Diagrams reduce the extraneous cognitive load of processing information, freeing cognitive resources for schema creation, in two ways. First, reading burdens working memory more than looking at an image. Each word, before a schema for a sentence or idea is formed, is processed as its own element. Because images can be processed as a single element, rather than many, they use less working memory, leaving capacity to form schemas. This is why visuals are generally more easily remembered than words, a phenomenon known as the pictorial superiority effect. While complex diagrams likely cannot be processed as a single element (at least before a schema of it is constructed), as long as they are processed as fewer elements than the text they represent, they will use less working memory.

Diagrams also save working memory capacity by reducing the cognitive cost of searching for information. Visually searching text for information is difficult and can take up substantial cognitive resources. With-

51. See Sweller et al., supra note 13, at 262-64.
52. See id. at 264-65.
54. Id; see also Burgess, supra note 24, at 47-51 (discussing some of the literature on pictorial superiority and its application to learning the law).
out an index or some other quick way to locate specific information in a
text, finding it can require searching the text sequentially.  
This means that each element that precedes the one being searched for must be pro-
cessed until the desired information is located. However, all of a dia-
gram’s elements can be viewed simultaneously.  
This allows the desired element to be located with much less cognitive effort.

In addition to reducing extraneous cognitive load, diagrams also fa-
cilitate schema creation by directing cognitive resources directly towards
that task. At their absolute best, diagrams can simply supply a schema
that people can adopt and learn. If the diagram perfectly represents and
organizes the elements of the information, people could internalize the
diagram and access it as a schema.

Even when diagrams are not quite this effective, they still aid in
schema creation. Diagrams can make the implicit logical relations be-
tween elements explicit, directing cognitive resources towards creating a
schema that incorporates those relations. For text, these implicit logical
relations can take the form of either cross-references or relational lan-
guage. Though doing so imposes additional cognitive load (as people
would be thinking about both the elements and their logical relation), be-
cause it is a germane load, it still aids in schema creation.

Thus, diagrams both decrease extraneous cognitive load and in-
crease germane cognitive load. With that said, there are potential cogni-
tive downsides of presenting diagrams along with text. First, there is a
risk that if people have to shift their attention between the diagram and
the text, extraneous cognitive load will be increased. This problem,
known as the split-attention effect, is most likely to occur when neither
the text nor the diagram can be understood without the other. However,
the effect can be mitigated by mapping the diagram to the text, for example by including section numbers in the diagram. Conversely, if both the diagram and the text can be fully understood independently, presenting both will make people process the same information twice, increasing extraneous cognitive load. This is known as the redundancy effect.

However, neither of these effects tends to empirically outweigh the benefits of diagrams. As demonstrated by the empirical studies showing diagrams’ ability to reduce cognitive load, the cognitive benefits outweigh the cognitive harms.

C. How Schemas Improve People’s Ability to Understand and Apply Statutes

To this point, I have discussed cognitive load theory and diagrams divorced from the context of statutes. This Section will discuss why all of the above is of particular importance for statutory interpretation.

It bears emphasizing how rife with potential statutory interpretation is for diagrammatic aids. Statutory interpretation is exactly the type of task where diagrams have the largest potential because reading and understanding a statute imposes an extremely high intrinsic cognitive load. Needless to say, many statutes have seemingly innumerable elements that must be processed. Moreover, modern statutes are generally about complex issues, requiring a high baseline of schemas to be approachable. Furthermore, the text is frequently dense, complicated, full of legal terms of art, and, at least as printed in the Statutes at Large, difficult to navigate, imposing high search costs. Though codification may somewhat alleviate this, the text of even one section of a statute can be hard to visually search.

Most importantly, however, statutes have many elements that can only be understood in relation to each other. As discussed in the Introduction, statutory language can only be fully understood in the context of the rest of the statute, either explicitly through cross-references or implicitly through the whole act canon. Regardless of whether one prefers tex-

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65. See Kalyuga et al., supra note 63, at 362-64.
66. See Sweller et al., supra note 13, at 283.
67. *Id.*
68. See supra notes 26-30.
69. Codification creates its own cognitive difficulties, as one statute is often codified throughout different titles of the United States Code, making it even more difficult to see how different sections implicitly work together.
70. See SCALIA & GARNER, supra note 5, at 167-70; see also William N. Eskridge, Jr. & Philip P. Frickey, *Statutory Interpretation as Practical Reasoning*, 42 STAN. L. REV. 321, 351 (1990) (analogizing statutory interpretation to a hermeneutical circle, in which each part is needed to understand the whole, and the whole is needed to understand each part).
tualism or purposivism, the meaning of a statutory phrase can only be fully understood through its relation to other statutory phrases. This requires multiple phrases of a statute to be held in working memory simultaneously, as well as their relation to one another. When statutes, especially more consequential ones, are frequently hundreds of pages, this type of material can impose an extremely high intrinsic cognitive load. Because intrinsic and extraneous cognitive loads are additive, decreasing extraneous cognitive load and focusing on germane cognitive load is most important for tasks with a high intrinsic cognitive load.

Diagrams can accomplish this reduction of extraneous load and substitution of germane load for statutes. First, the pictorial superiority effect should apply to statutes. Each phrase or section of a statute would initially be processed as its own element, but the diagram, as an image, could be processed as fewer elements. Second, diagrams can provide a visual map of the statute’s various sections to reduce search costs. Third, diagrams of a statute’s rules would directly facilitate creating a schema of the statute. At best, if the diagram successfully depicts all of a statute’s key rules and the relationship between those rules, the diagram could provide the schema. Even if a diagram fell short of this ideal, it could still facilitate schema creation by highlighting the relational language of a statute and the logical connections between sections.

Having a schema of a statute allows it to be held in working memory as fewer elements, leaving cognitive resources available for other things. This is important for statutory interpretation because understanding the rules of a statute is only half of the task. An interpreter also must simultaneously consider the facts of a case and contemplate how the statute’s rules apply to those facts. Thus, having a schema of a statute’s rules frees cognitive resources to consider how to apply the statute to the case at hand. Having these additional cognitive resources to consider the proper application of the statute will help interpreters do so more accurately.

71. See Nourse, supra note 11.
73. See Marcus et al., supra note 34, at 50.
74. See Sweller et al., supra note 13, at 263.
75. In fact, when asked whether they found having a diagram to be helpful, eleven subjects from Experiment 1 reported that the diagram helped them locate relevant provisions of the statute. See infra Section II.A.
D. The Risk of Diagrams Biasing Interpretation

Before proceeding to the empirical evidence that diagrams aid in understanding and applying statutes, it is important to discuss one downside risk of statutory diagrams. A diagram facilitating schema creation is an unmitigated good when the information being schematized is wholly objective. There may be only one valid schema of the information, and even if there are multiple ways to schematize the information, since there is ultimately an objectively correct understanding of the information, all valid schemas should lead to the same understanding.

Statutes, however, are not wholly objective; they are frequently ambiguous. If a statute is ambiguous, then it lends itself to the creation of different schemas, one for each possible interpretation. When this is the case, diagrams could lead to bias by facilitating the creation of one particular schema of a statute when an alternative schema of a statute is equally, or more, correct.

In the absence of a diagram, a dedicated interpreter would hopefully adopt whichever schema best resolves the ambiguity. However, with a diagram, an interpreter is likely to adopt whichever schema the diagram facilitates. This would bias an interpreter towards one particular resolution of the ambiguity. If this resolution is not the best one, then diagrams could lead interpreters astray.

II. The Empirical Case for Diagrams

This Part provides a brief overview of the experimental methodology and central results. Readers interested in the detailed methodology or other results, including summary statistics and robustness checks, should consult the Appendix.

A. Experiment 1: Methods and Results

The goal of Experiment 1 was to establish whether having a diagram outlining a statute’s structure and rules decreases the cognitive load required to understand and apply the statute. I created diagrams of the War Powers Resolution and Federal Arbitration Act for use

76. For example, there is only one schema for organizing letters into a word.
77. See Marcus et al., supra note 34 (discussing how diagrams can provide a schema to adopt).
79. United States Arbitration Act, ch. 213, 43 Stat. 883 (1925) (codified as amended at 9 U.S.C. §§ 1-16 (2018)). To avoid introducing the complexity of how to interpret statutory amendments, the unamended, 1925 version of the statute was used.
in the experiment. The WPR and FAA were selected for a few reasons. First, both statutes are the optimal length for the experiment: they are short enough to diagram the entirety of the statute but long enough that they have substantial structural complexity. Second, both the WPR and FAA have had controversies over their application.\textsuperscript{80} Finally, while both statutes are well known enough that many subjects would have heard of them, they are not so well known that most would know the details of their text.

The WPR diagram, shown in Figures 1 and 2, was designed to reduce cognitive costs in a few ways. First, the stated purpose of the WPR in Section 2 is prominently displayed at the top of the diagram, while in the text of the statute it is distant from the operative clauses that interpreters are likely to focus on, thus reducing search costs. Furthermore, the diagram highlights the relationship between Section 8, where “introduced” is defined, and Section 4, where “introduced” is used in an operative clause. Similarly, the diagram highlights that “hostilities” is measured contrapositive to “introducing forces equipped for combat” and “substantially enlarging existing numbers of troops,” while also highlighting the relationship between “hostilities” and the triggers for the President’s commander-in-chief powers.

In the FAA diagram, shown in Figures 3 and 4, the scope of the FAA’s coverage is more clearly demonstrated by the visual separation of the savings clause than the text of a proviso. The fork in the diagram between Sections 3 and 4 shows that there are two separate problems, with two separate sets of rules, that can occur when an arbitration clause is not followed. The diagram clarifies the relationship between Sections 9, 10, and 11, namely that unless the courts are empowered by Sections 10 or 11, they must follow Section 9. Finally, the colors in the boxes make the discretionary/mandatory function distinction quickly clear.

Figure 1: War Powers Resolution Diagram (Page 1)
Figure 3: Federal Arbitration Act Diagram
Subjects reviewed the text of either the WPR or the FAA and then took a quiz. The quizzes were comprised of nine multiple-choice questions, each of which presented a hypothetical scenario and asked what the statute required. Answering these hypotheticals generally required subjects to identify the specific rule (procedural or substantive) that the statute provided for the situation, and apply it to the situation.\textsuperscript{81}

81. Some readers might be concerned that the quiz questions were unduly tailored to the information presented in the diagrams, which would limit the generalizability of the conclusion that diagrams reduce cognitive load. The fact that both the diagrams and questions were self-designed is certainly a limitation of the study. That being said, I believe the questions were general enough hypotheticals that they were not unduly tailored. Two examples are presented here to give a sense of this, and for curious readers, the full quizzes are reproduced in the Appendix.
After completing the quiz for one statute, subjects then reviewed the text of the second statute, and then completed that statute’s quiz. For one of the statutes, but not the other, subjects were also given the diagram to review. This isolated the effect of the diagram on subjects’ performance.

The primary variable of interest was subjects’ performance on the quizzes. Using task performance is a common proxy for cognitive load, with higher performances indicating a lower cognitive load. By comparing how accurately subjects applied the statutes to the hypotheticals when they did and did not have the diagram, I was able to measure whether having the diagram reduced the cognitive load of understanding and applying the statute.

The ingoing hypothesis was that subjects’ performance on the quiz should be better when they have a diagram in addition to the text of the statute. To test this hypothesis, I ran an ordinary least squares regression with the quiz score as the dependent variable. The results are presented in Table 1 below:

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Question 6 of the WPR quiz read: “Following some unrest in Eastern Europe, the President determines that it would be strategically valuable to send a three-star general, along with a small group of troops, to high level NATO command to monitor the situation. There is no expectation that the troops will be engaging in an exchange of fire with enemy combatants, but they are nevertheless equipped for combat as a security measure for the general. Which of the following must the President do, according to the WPR?” The incorrect answer choices were: (1) “The President must consult with Congress before sending the general and troops abroad,” (2) “The President must withdraw the general and troops within 60 days, barring Congressional action or a 30 day extension,” and (3) “The President must seek Congressional statutory authorization to allow sending the general and troops.” The correct answer was: “The President has no requirements under the WPR in this situation.”

Question 1 of the FAA quiz read: “Bob, a sailor who works on a boat that ships goods overseas has not been paid by the owner of the boat, Jim, who employs him, for over 6 months. Jim hasn’t been paying his employees because business has been slow and he wants to keep cash in reserve as a backup. Bob’s contract of employment specifies that he will be paid every month, and also specifies that the sailors will arbitrate any disputes they have with Jim. Bob sues Jim in federal court for breach of contract; Jim asks the court to stay the lawsuit so they can arbitrate. What should the court do?” The incorrect answer choices were: (1) “Stay the lawsuit and compel arbitration,” (2) “Stay the lawsuit but do not compel arbitration,” and (3) “Have a hearing to determine whether or not there was an arbitration clause.” The correct answer choice was: “Have a trial to determine whether Jim breached the contract.”

82. Sweller et al., supra note 13, at 266-68; see, e.g., Curtis L. Pyke, The Use of Symbols, Words, and Diagrams as Indicators of Mathematical Cognition: A Causal Model, 34 J. RES. MATHEMATICS 406, 416-19 (2003); Sato & Mineshima, supra note 29, at 430.
Table 1: Main Regression Results

<table>
<thead>
<tr>
<th></th>
<th>Dependent variable:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quiz Score (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Diagram</td>
<td>0.101***</td>
<td>0.098*</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.054)</td>
</tr>
<tr>
<td>Statute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAA</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>(N/A)</td>
<td>(N/A)</td>
</tr>
<tr>
<td>WPR</td>
<td>-0.133***</td>
<td>-0.138**</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Quiz Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>(N/A)</td>
<td>(N/A)</td>
</tr>
<tr>
<td>Second</td>
<td>-0.013</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Time</td>
<td>0.001</td>
<td>0.00002</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.107</td>
<td>0.607</td>
</tr>
<tr>
<td></td>
<td>(0.504)</td>
<td>(0.446)</td>
</tr>
<tr>
<td>Observations</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>R²</td>
<td>0.861</td>
<td>0.141</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.684</td>
<td>0.078</td>
</tr>
<tr>
<td>Residual Std. Error</td>
<td>0.121 (df = 26)</td>
<td>0.207 (df = 55)</td>
</tr>
<tr>
<td>F Statistic</td>
<td>4.875*** (df = 33; 26)</td>
<td>2.256* (df = 4; 55)</td>
</tr>
</tbody>
</table>

*Standard errors are reported below each coefficient in parentheses. *p<.10, **p<.05, ***p<.01.

Column 1 presents regression coefficients controlling for the fixed effect of each subject. The coefficients for the fixed effect of each subject are omitted for space. Column 2 presents the regression coefficients without controlling for the fixed effect of each subject. The most important coefficient is the one for the Diagram variable. When controlling for the fixed effect of each subject, as is done in a within-subject test, the

83. Controlling for the fixed effect of each subject controls for each subject’s individual skill at the task. Because each subject completed the task both with and without a diagram, this does not bias the result. See infra text accompanying notes 213-215 in the Appendix for more details.

84. Gary Charness, Uri Gneezy & Michael A. Kuhn, Experimental Methods: Between-Subject and Within-Subject Design. 81 J. ECON. BEHAV. & ORG. 1, 6 (2012). Within-subject experiments are those in which each subject is exposed to both the control and treatment, so the measure of the treatment can be measured within each subject.
diagram improved quiz scores by 10 percentage points. This result was significant at the 1% level. The magnitude of the effect barely changes when the fixed effect of each subject is removed from the analysis, and that result is still significant at the 10% level. This result supports the hypothesis that the diagrams improved subjects’ performance on the quizzes. Because the quizzes required subjects to understand and apply statutory rules, this in turn supports the hypothesis that diagrams reduce the cognitive load of understanding and applying statutes. Critically, the sample was large enough to draw statistically significant conclusions. Further supporting this result, 90% of subjects self-reported that having the diagram was helpful to understanding the statute.

There are a few noteworthy aspects of the coefficients for the control variables. First, subjects performed roughly 13 percentage points worse on the WPR quiz than on the FAA quiz. This indicates that the WPR quiz was more difficult than the FAA quiz; however, because roughly half of the subjects had the diagram for each of the statutes, this does not confound the main result. Second, there was no statistically significant difference between subjects’ performance on the first and second quiz. This indicates that, on average, whatever effects practice or fatigue had on subjects’ performance cancelled each other out, removing another potential confound from the main result. Finally, there was virtually no relationship between how long subjects spent on the quizzes and their performance.

B. Experiment 2: Methods and Results

The goal of Experiment 2 was to empirically establish that it was possible that different diagrams of the same statute could drive people to interpret and apply the statute differently. I created two different diagrams of the hypothetical Parks Safety Act from the famed “No Vehicles in the Park” hypothetical, seen below in Figures 5 and 6. The Parks

85. Importantly, it does not indicate that the WPR diagram was of lesser quality than the FAA diagram, because the subjects performed worse on the WPR quiz without the WPR diagram than on the FAA quiz without the FAA diagram. See infra Appendix.

86. The statute reads:
SECTION 1. The Council finds that vehicles create safety problems when they are operated in parks and further finds that the best solution is to ban any and all vehicles from all municipal parks.
SEC. 2. No vehicles of any kind shall be allowed in any municipal park. Any person who brings or drives a vehicle into one of these parks shall be guilty of a misdemeanor, which may be punished by a fine not exceeding $500 or by a two-day incarceration in the municipal jail, or both.
SEC. 3. “Vehicle” for purposes of this law means any mechanism for conveying a person from one place to another, including motorcycles, automobiles, trucks, and motor
Safety Act was selected because there are many borderline cases of the statute’s application. These borderline cases create the perfect opportunity to test whether the diagram can bias people’s interpretation of the statute because there is no clearly correct answer to them.

The “Rule” Diagram presented Section 1 of the statute, which contains the legislature’s reason for the statute, as part of the test for whether or not the statute is violated in a given situation. The Rule Diagram was designed to bias subjects against saying the statute was violated by indicating that the statute was violated only when the type of vehicle in the situation might cause safety problems. The “Purpose” Diagram excluded Section 1 from the flow chart laying out the legal test, and instead presented a reminder of the stated purpose of the statute above the flow chart. The Purpose Diagram was designed to bias subjects towards saying the statute was violated by indicating that the statute might still be violated even in completely safe situations.

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scooters. Provided that, bicycles shall be allowed in the park, so long as they are being pushed or carried and not ridden.

Figure 5: Parks Safety Act „Rule” Diagram
Subjects were given either the Purpose or Rule Diagrams, along with the text of the hypothetical Act. They were then asked their opinion on whether or not the statute was violated in a variety of scenarios. The dependent variable of interest was the number of scenarios subjects believed ran afoul of the Parks Safety Act.

The hypothesis for Experiment 2 was that subjects with the Rule Diagram would say the statute was violated in fewer scenarios than those with the Purpose Diagram. To test this, I ran an unpaired, one-tailed t-
I ran the t-test on two sets of scenarios. The first set ("Full Scenario Set") included all twelve scenarios. The second set ("Controversial Subset") removed four of these scenarios because they did not generate substantial disagreement about whether or not the statute was violated (i.e., more than 95% of subjects believed the statute was violated). The results of the t-test are presented below in Table 2.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Diagram</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>T-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scenario Set</td>
<td>Purpose</td>
<td>20</td>
<td>10.60</td>
<td>2.14</td>
<td>1.57*</td>
</tr>
<tr>
<td></td>
<td>Rule</td>
<td>20</td>
<td>9.35</td>
<td>2.85</td>
<td></td>
</tr>
<tr>
<td>Controversial Subset</td>
<td>Purpose</td>
<td>20</td>
<td>6.70</td>
<td>1.89</td>
<td>1.74**</td>
</tr>
<tr>
<td></td>
<td>Rule</td>
<td>20</td>
<td>5.40</td>
<td>2.77</td>
<td></td>
</tr>
</tbody>
</table>

*p<.10, **p<.05, ***p<.01.

These results confirm the hypothesis that subjects with the Rule Diagram were less likely to believe the Parks Safety Act was violated than those with the Purpose Diagram. Specifically, subjects given the Purpose Diagram believed the statute was violated in 84% of the controversial scenarios, whereas subjects given the Rule Diagram believed the statute was violated in 68% of those same scenarios. Importantly, the t-test shows that there is less than a 5% chance that this difference was due to random chance. Given that the only difference between the two groups was which diagram they had, and given that the diagram assignment was random, this indicates the diagram drove the difference. This demonstrates the potential for diagrams to bias people’s interpretation of statutes.

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88. An unpaired t-test is used when the two samples are from different test subjects. Because one set of subjects had the Rule Diagram, and another had the Purpose Diagram, I used an unpaired t-test. A one-tailed t-test tests whether one sample's mean is different from another's in a particular direction. See FAQ: What Are the Differences Between One-Tailed and Two-Tailed Tests?, UCLA INST. FOR DIGITAL RES. & EDUC., https://stats.idre.ucla.edu/other/mult-pkg/faq/general/faq-what-are-the-differences-between-one-tailed-and-two-tailed-tests [https://perma.cc/BGM5-6SLP]. As my hypothesis was that the Rule Diagram would lead to fewer applications of the statute than the Purpose Diagram, I used a one-tailed t-test.

89. The difference is less strong when the noncontroversial scenarios are included in the t-test, but this too was statistically significant at the 10% level.
III. Uses for Statutory Diagrams

The combined results of Experiments 1 and 2 thus present a challenge. On the one hand, Experiment 1 shows that statutory diagrams decrease the cognitive load required to understand and apply statutes. As discussed below, this insight carries with it enormous potential for improving how statutes are drafted, communicated, and interpreted. On the other hand, Experiment 2 demonstrates the potential danger of diagrams. An ambiguous statute can be diagrammed in multiple valid ways, and these different diagrams can bias how people interpret the statute.

What is needed, then, are ways to leverage the cognitive benefits of diagrams while minimizing the risk of bias or manipulation. This section explores how this might be done by judges to interpret statutes better; by agencies to communicate statutes better; by legislatures to draft statutes better; and finally, as law to make statutes themselves better. For each of these stages, I begin with a more in-depth discussion of how diagrams could be implemented, and then discuss the primary new benefits and how to mitigate the bias risk.

My discussion of diagrams at any of these stages will not capture all of the nuances of how diagrams would work at that stage. Rather, my hope is that by illustrating the wide variety of ways statutory diagrams could theoretically be useful, I will convince skeptical readers that statutory diagrams are an interpretive tool worth consideration.

A. Diagrams as Judges’ Interpretive Tools

This Section discusses how judges can use statutory diagrams to better interpret statutes. Judges could use these statutory diagrams in much the same way some judges use sentence diagrams. They could be created by lawyers arguing statutory cases before the judge, by the judge’s clerks, or by the judge herself, and then consulted to determine the correct interpretation of the statute. Importantly, both textualist and purposivist judges should be able to embrace diagrams because decreasing the cognitive load required to understand statutes speaks to the normative values backing both theories. Though the nature of an independent judiciary augments the risk of biased diagrams, this risk is not unique to diagrams and can be somewhat mitigated by both the adversarial process and appellate review.

1. Implementing Diagrams at the Interpretive Stage

When faced with a difficult statutory interpretation case, a judge could create the diagram in order to better understand the statutory scheme. Alternatively, the lawyers arguing the case could create diagrams
in order to show the judge that the correct interpretation of the statute is the one favoring their client.\textsuperscript{90}

While judges do not, to my knowledge, currently create statutory diagrams of this kind, some judges do engage in the conceptually distinct, but overall analogous practice of sentence diagramming.\textsuperscript{91} Sentence diagramming is the practice of taking one sentence of a statute and creating a grammatical diagram of it in order to visualize the “grammatical relationship of the words, phrases, and clauses in a sentence.”\textsuperscript{92} Notably, Justice Gorsuch is a major proponent of sentence diagramming, leveraging it in a case\textsuperscript{93} that he listed as one of his ten most significant pre-Supreme Court cases.\textsuperscript{94} Though rarer, sentence diagrams have also been deployed by lawyers in briefs.\textsuperscript{95} Of course, sentence diagramming is not uniformly embraced by judges, nor is it a useful exercise in all statutory interpretation cases.\textsuperscript{96} Nevertheless, in the right context, many judges find it to be a useful practice.

Understanding the reason some judges embrace sentence diagrams helps show why statutory diagrams are an analogous interpretive tool which could be similarly embraced. Just as tools like dictionaries\textsuperscript{97} and corpus linguistics\textsuperscript{98} are sometimes employed by judges to implement the semantic canons, sentence diagramming is used to implement the syntactic canons.\textsuperscript{99} Statutory diagrams of the sort used in Experiments 1 and 2, then, would be used by judges to implement the contextual canons, such as the whole act canon.\textsuperscript{100}

\textsuperscript{90}. See, e.g., Dubose, supra note 23, at 26 (discussing the use of visuals in appellate briefs); Rosman, supra note 23, at 71 (same).
\textsuperscript{91}. See Jamie Durling, Comment, Diagramming Interpretation, 35 YALE J. ON REG. 325, 327 (2018).
\textsuperscript{92}. Lisa Eichorn, Sister Bernadette and the Potential Revival of Sentence Diagramming in Written Legal Advocacy, 13 LEGAL COMM. & RHETORIC 79, 82 (2016).
\textsuperscript{93}. United States v. Rentz, 777 F.3d 1105 (10th Cir. 2015).
\textsuperscript{94}. See Durling, supra note 91, at 326 (citing Alison Frankel, Decoding Gorsuch’s Picks for His 10 Most Significant Opinions, REUTERS (Feb. 15, 2017, 6:46 PM), https://www.reuters.com/article/us-otc-gorsuch/decoding-gorsuchs-picks-for-his-10-most-significant-opinions-idUSKBN15U2WZ [https://perma.cc/CB2M-BTHJ]).
\textsuperscript{95}. Eichorn, supra note 92, at 81.
\textsuperscript{96}. See Durling, supra note 91, at 333-34 (discussing when sentence diagrams conflict with other interpretive techniques).
\textsuperscript{97}. See James J. Brudney & Lawrence Baum, Oasis or Mirage: The Supreme Court’s Thirst for Dictionaries in the Rehnquist and Roberts Eras, 55 WM. & MARY L. REV. 483 (2013).
\textsuperscript{99}. See Durling, supra note 91, at 328; see also SCALIA & GARNER, supra note 5, at 140-66 (laying out the syntactic canons).
\textsuperscript{100}. See SCALIA & GARNER, supra note 5, at 167-240 (laying out the contextual canons).
Often, then, statutory diagrams should be even more embraced by judges because, as noted sentence diagram enthusiast then-Judge Gorsuch said, “[w]e are not permitted by the Supreme Court to interpret isolated statutory phrases solely according to grammatical diagrams. We must take account of Congress’s grammar to be sure, but the Court also requires us to take account of surrounding text, structure, and context.”101 Moreover, statutory diagrams could be embraced by even more judges than sentence diagrams because sentence diagrams are a distinctively textualist enterprise,102 while, as discussed below, statutory diagrams would be of use to both textualists and purposivists.

Of course, as with sentence diagrams, it is unlikely statutory diagrams would be embraced by every judge. Nor would statutory diagrams necessarily be useful in every statutory interpretation case. However, because the context of the statutory language is so often relevant to interpreting the statute, it is reasonable to believe that judges could embrace them as an interpretive tool in many difficult cases. And for the reasons discussed below, this would be normatively good.

2. Diagrams, Textualism, and the Rule of Law

Textualism is normatively backed by rule of law values, particularly predictability.103 The consideration of factors outside the text, such as the purpose of a statute, the enacting Congress’s intent, or legislative history, tends towards judges injecting their personal beliefs into their interpretation of the law.104 This in turn undermines the rule of law’s value of predictability, as predicting how the case will be decided requires predicting the judge’s personal beliefs.105 When judges consult sources besides the text of the law and (subconsciously or otherwise) inject their personal preferences into the interpretation, their decisions become more arbitrary and less predictable, making it more difficult for people to understand...
how the law will be applied to them. By restricting themselves to finding the fair meaning of the text, judges’ decisions will be more predictable, allowing people to understand the law that governs them.

Or so textualists argue. Whether textualism as applied in fact actualizes rule of law values is hotly contested. Though the textualist mantra is that “in their full context, words mean what they conveyed to reasonable people at the time they were written,” critics like Victoria Nourse argue that textualist judges often engage in “isolationist” interpretation, taking a small part of the whole text (typically a word or phrase, not even an entire section), and deciding the case based on the decontextualized meaning of that word or phrase. This approach fails to prevent them from inserting (subconsciously or otherwise) their personal preferences into their interpretations, rendering decisions unpredictable.

The isolationist interpretive method differs from textualism’s platonie ideal in a few critical ways. First, the ideal textualist judge would not have to make any decisions about what to include in their inquiry; the relevant statute would be presented to them and they would include it in its entirety. With isolationist textualism, judges have to decide which part of the text to isolate, introducing some degree of discretion. Second, the ideal textualist judge would use the context created by the rest of the statute to enrich the meaning of ambiguous words or phrases. Isolationist textualist judges would not have this context, and instead would add their own “pragmatic enrichments” to the text. A pragmatic enrichment is “the addition of apparent meaning to a literal text.” For example, translating the word “fifth” to mean either the Fifth Amendment, 20%, or a fifth of liquor is a pragmatic enrichment. Ideal textualist judges would cancel incorrect enrichments by consulting the rest of the text, but isolationist textualist judges would not.

Each way that isolationist interpretation differs from ideal textualism makes the law less predictable. First, because judges have discretion

107. See, e.g., VICTORIA NOURSE, MISREADING LAW, MISREADING DEMOCRACY 103-134 (2016); Nourse, supra note 11.
108. SCALIA & GARNER, supra note 5, at 16 (emphasis added).
109. See Nourse, supra note 11, at 1409.
110. See id. at 1411. Elsewhere, she has called this “petty textualism.” See NOURSE, supra note 107, at 103.
111. See Nourse, supra note 11, at 1410.
112. See id. at 1412-20.
113. Id. at 1415.
114. Id. at 1412.
in choosing which text to isolate, they may “pick or choose their friends” from among the statute’s text.\footnote{Id. at 1410.} In addition to creating a risk that they will insert their personal preferences into their interpretation, it leaves those governed by the law to guess which word or phrase would be isolated in their case. If different selections lead to different outcomes, people cannot predict how the law will actually apply to them.

Second, because isolated text requires pragmatic enrichments and there are multiple enrichments that could be added to a text, there are multiple ways to interpret an isolated text. When the whole text is considered, people can use context to determine which enrichment is most properly added to the literal meaning of the text. However, when the word or phrase is isolated, people have no way of knowing which pragmatic enrichment a judge may add to the word or phrase. This leaves them with no way to predict how the law would be interpreted and applied to their conduct.

What is puzzling about isolationist interpretation is why judges engage in it. Nobody is pro-isolationist interpretation; as Professor Nourse says, “no modern textualist, nor any modern purposivist, rejects the whole text.”\footnote{Id. at 1430.} One possible explanation for this phenomenon is the cognitive difficulty of ideal textualism. All people are constrained by bounded rationality,\footnote{See Conlisk, supra note 14, at 670-71 (listing sources reviewing the evidence for bounded rationality).} which causes people to subconsciously conserve cognitive resources. One instantiation of this is “bounded awareness—that we are aware of only some facets of a problem at first glance, which leads to overvaluing one aspect of a problem at the expense of unstated, presumed background context.”\footnote{Nourse, supra note 107, at 118; see also Benjamin Enke, What You See Is All There Is (Sept. 23, 2017) (unpublished manuscript), https://ssrn.com/abstract=2691907 [https://perma.cc/38P3-KAJ9] (providing empirical evidence of bounded awareness).} Given statutory interpretation’s high intrinsic cognitive load, this explanation is appealing.

If bounded rationality is the reason for isolationist interpretation, then statutory diagrams are an excellent prophylactic. Diagrams, by reducing the cognitive load needed to understand the statute, can eliminate the underlying cause of isolationist interpretation. Moreover, diagrams can create the cognitive capacity needed to actually synthesize the key text with the context of the whole act, cancelling any incorrect pragmatic enrichments. Finally, if the diagram creates a schema of the entire statute (as opposed to an isolated part of it), it would make judges less likely to conceive of statutes as isolated parts to begin with. By combating isolationist interpretation and pushing textualism as actually applied towards
its ideal form, statutory diagrams can make the law more predictable, helping to actualize textualism’s rule of law goals.

3. Diagrams, Purposivism, and Good Governance

The normative backing of purposivism is good governance, which is a form of quasi-consequentialism that sees the nature and function of law as the means of maximizing the satisfaction of valid human demands. According to the legal process theory, from which purposivism stems, the law is inherently purposive because it is always aimed at remediying some mischief or satisfying some desire. A statute, as an instantiation of the law, is also purposive in this way.

On this account of the function of law, the end goal of the legal process is for the government to efficiently remedy society’s problems and meet citizens’ desires. According to purposivists, judges, when interpreting statutes, can best help the government function by identifying the mischief the statute was seeking to remedy (i.e., its purpose), and interpret the statute in a way that remedies that mischief. This form of interpretation lets the judge act as a cooperative partner in the enterprise of solving the problem Congress set out to solve with the statute, rather than as a roadblock.

Of course, in order for a purposivist approach to statutory interpretation to enable good governance, judges must be able to successfully identify the purpose of a statute. The statute is, after all, the legislature’s project, and the court must “respect the position of the legislature as the chief policy-determining agency of the society.” If the court cannot identify the mischief the legislature was trying to remedy with the statute, they will be unable to interpret the statute to advance that purpose. Instead, the court may create its own purpose for the statute and interpret it to advance the court’s purpose. If the judicially-created purpose does not match the legislative one, the branches will not have the cooperative relationship to which purposivism aspires.

120. See HART & SACKS, supra note 12, at 102-13; see also Charles L. Barzun, The Forgotten Foundations of Hart and Sacks, 99 VA. L. REV. 1, 18-25 (2013) (discussing why Hart and Sacks’s theory is consequentialist, but not purely utilitarian).
121. See id at 1111 (presenting the formulation in Heydon’s Case).
123. HART & SACKS, supra note 12, at 1374.
124. See BREYER, supra note 123, at 88. Justice Breyer also identifies other ways the purposivist approach improves the governance process. A purposivist approach to interpreting
fy the legislature’s purpose, instead of purposivism leading to good governance, it leads to violations of separation of powers and usurpation of political power by an unelected branch of government.

Recognizing the importance of judges’ ability to identify a statute’s purpose, Hart and Sacks ended their textbook with instructions for judges to do just that.\textsuperscript{126} First, when a statute has a formally enacted purpose section, the court should accept it unless it is inconsistent with the words and context of the statute.\textsuperscript{127} This seems simple, but even when there is an explicit purpose, judges must determine which means, if any, are out of bounds in pursuing this purpose and how this purpose fits into the larger legal system.\textsuperscript{128} More commonly, when there is no enacted purpose, judges will have to infer the statute’s purpose. To do this, the court must “compare the new law with the old,” and determine what “mischief” in the old law the new law was remedying.\textsuperscript{129} This is an inherently pluralist exercise; Hart and Sacks instruct judges to consider the whole act, legislative history, public statements of the statute’s purpose, administrative interpretations of the statute, judicial precedents, and popular perception of the statute.\textsuperscript{130}

Applying Hart and Sacks’s methodology for identifying a statute’s purpose is extremely cognitively demanding. Each of the sources that Hart and Sacks suggest consulting will use working memory, and integrating the sources to find one unifying purpose will use even more. Even when there is an enacted purpose statement, determining the boundaries of the legislature’s willingness to pursue this purpose is similarly cognitively demanding.

Diagrams can reduce the cognitive difficulty of determining a statute’s purpose. When a statute has an enacted purpose statement, it can be integrated into the diagram to make its relationship to the operative clauses more explicit.\textsuperscript{131} Moreover, if the enacted purpose is limited, a diagram can make these limitations more explicit than text.\textsuperscript{132} When there is no enacted purpose, diagrams’ facilitation of schema creation can create additional cognitive capacity to integrate the plural sources needed

\textsuperscript{126} See HART \& SACKS, supra note 12, at 1377-80.
\textsuperscript{127} Id. at 1377. For an example of this type of language, see Section 2 of the WPR.
\textsuperscript{128} Id.
\textsuperscript{129} Id. at 1378.
\textsuperscript{130} Id. at 1379-80.
\textsuperscript{131} For an example of this, see supra Figure 5.
\textsuperscript{132} See SHIMOJIMA, supra note 60, at 3-5.
for a purposivist inquiry. By making it easier to discover and apply a statute’s purpose, diagrams can help actualize purposivism’s value of good governance.

4. Mitigating Bias in Judicially-Created Diagrams

The largest downside risk of using diagrams at the interpretive stage is the risk of biased interpretation, as highlighted by Experiment 2. The diagram could be used by a judge or lawyer to argue that one interpretation of an ambiguous statute is unambiguously correct. This would be problematic if the diagrammed resolution of the ambiguity was not the best resolution. It would also be a problem if the ambiguity in the statute was created deliberately, as a way for the legislature to delegate the resolution of the question to the executive branch; the diagram might then be used to prevent judicial deference to the executive’s interpretation of the statute.\(^{133}\) This risk admittedly does diminish diagrams’ appeal for both textualist and purposivist judges.

However, this risk is not necessarily a reason for judges not to use diagrams, in part because this risk is not at all unique to diagrams. Every interpretive tool is criticized on this basis, including the canons,\(^{134}\) dictionaries,\(^{135}\) and legislative history.\(^{136}\) Despite this, all of these tools are embraced by at least some judges as useful tools for interpreting statutes.

Moreover, the pluralism inherent in the judicial system mitigates this risk. There are two sides to every case; the theory behind the adversarial process is that both sides zealously advocating for their version of the facts leads to the truth ultimately emerging.\(^{137}\) What is true for two sides


\(^{134}\) See James J. Brudney, Canon Shortfalls and the Virtues of Political Branch Interpretive Assets, 98 CALIF. L. REV. 1199, 1202 (2010) (“One language canon may trump another, one substantive canon may displace another, and a language canon may be deemed subservient to a substantive canon in one instance and dominant in the next. This lack of an intelligible framework for ordering the canons renders them distinctly more susceptible to judicial manipulation than other interpretive resources.”); Karl N. Llewellyn, Remarks on the Theory of Appellate Decision and the Rules or Canons About How Statutes Are To Be Construed, 3 VAND. L. REV. 395 (1950).

\(^{135}\) See Ellen P. Aprill, The Law of the Word: Dictionary Shopping in the Supreme Court, 30 ARIZ. ST. L.J. 275 (1998); A. Raymond Randolph, Dictionaries, Plain Meaning, and Context in Statutory Interpretation, 17 HARV. J.L. & PUB. POL’Y 71, 72 (1994) (“[C]iting to dictionaries creates a sort of optical illusion, conveying the existence of certainty—or ‘plainness’—when appearance may be all there is.”).

\(^{136}\) Patricia M. Wald, Some Observations on the Use of Legislative History in the 1981 Supreme Court Term, 68 IOWA L. REV. 195, 214 (1983) (“It sometimes seems that citing legislative history is still, as my late colleague Harold Leventhal once observed, akin to ‘looking over a crowd and picking out your friends.’”).

\(^{137}\) Admittedly, it is debatable how well suited the adversarial process actually is to truth seeking. For a wonderful example of this debate, see Marvin E. Frankel, The Search for
arguing about the accurate version of events can be equally true for two sides arguing about the correct interpretation of a statute. If one side uses one diagram of an ambiguous statute, the other can as well. The same logic applies to the fact that statutory interpretation, at least at the appellate level, is typically done by a panel of judges. If one judge creates a biased diagram, another judge can correct it, at least in cases where the panel has another judge who disagrees with the interpretation implied by the diagram.¹³８

The upshot of all this is that, “as with dictionaries [and sentence diagrams] and even well-accepted canons of interpretation, our debate should be about how to diagram correctly . . . not whether to diagram in the first place.”¹³⁹ There is certainly a debate to be had about the best practices for judges leveraging statutory diagrams to capture the cognitive benefits without creating biases, which I will not attempt to resolve with this Note. My hope is that this section has convinced readers that statutory diagrams, like other interpretive tools, have enough upside to be worth employing despite this risk.

**B. Diagrams as Agencies’ Communication Tools**

Statutory diagrams can be promulgated as interpretive rules by agencies charged with administering them in order to better communicate them to the public. Though not always required to do so by the Administrative Procedure Act (APA), these agencies could and should put the diagrams through notice-and-comment procedures.¹⁴⁰ Promulgating statutory diagrams in this way would help increase the transparency of a statute’s rules to those governed by it. The main risk would be that the agency creates a diagram which biases the interpretation of the statute; however, existing administrative law doctrines surrounding agency statutory interpretations either nullify or mitigate this risk.

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¹³⁹. Cf. Cass R. Sunstein, David Schkade & Lisa Michelle Ellman, Ideological Voting on Federal Courts of Appeals: A Preliminary Investigation, 90 VA. L. REV. 301 (2004) (finding that when three-judge panels are ideological diverse, ideological decisions are dampened, which generally supports the proposition that judges sitting on a panel are influenced by each other, which could curb the risk of bias).

¹⁴⁰. Sometimes the agency would be required to use notice-and-comment, or other procedures, by statutes other than the APA or by existing agency regulations. See PETER L. STRAUSS, ADMINISTRATIVE JUSTICE IN THE UNITED STATES 222 (2d ed. 2002).
1. Implementing Diagrams Through Agencies

Though when we think of who is responsible for statutory interpretation we often picture judges, the most common statutory interpreter is actually agencies. For most statutes, one or more agency is charged with actually ironing out the details and making the statutory commands reality. Often, in order to flesh out the requirements of the statute, agencies will promulgate regulations with more detailed requirements than the statute authorizing the regulations. The paradigmatic example of this is when the agency promulgates a legislative rule that adds detail to the statutory requirements using the notice-and-comment procedures detailed by Section 553 of the APA. However, agencies sometimes may clarify or gloss the statutes’ requirements without using notice-and-comment procedures. For example, when the agency’s regulation “merely clarify[es] or explain[s] existing law or regulations,” and does not affect substantive rights, it is deemed an “interpretive rule,” which is exempted from notice-and-comment requirements.

The purpose of these interpretive rules and other guidance documents is to help the agency communicate the statute’s rules to the public. By clarifying how the agency will interpret the statute, the agency can clarify to the public what the statute, in practice, requires them to do. The reason for excusing such rules from notice-and-comment procedural requirements is that the increased transparency interpretive rules provide by clarifying ambiguities outweighs the increased transparency of notice-and-comment procedures. The desire for transparency also explains why agencies are required to publish all of their interpretive rules under the Freedom of Information Act. Though the exact line between legislative rules and interpretive rules is difficult to draw, promulgating rules that are at least intended to solely explain to the public how to interpret a statute is something agencies do regularly.

141. ESKRIDGE ET AL., supra note 86, at 18 (“Most of the story is worked out not by judges, but by those implementing the statute.”).
145. See STRAUSS, supra note 140, at 222-24 (discussing interpretive rules as a form of publication rules).
146. See Bowen, 834 F.2d at 1045.
This means that agencies are already practiced at doing what statutory diagrams are designed to do: make it easier for the public to understand what, precisely, a statute requires. Though, to this point, these interpretive rules have taken the form of explanatory text, this does not have to be the case. Agencies could create statutory diagrams that explain their view of how the statutory sections work together to create a regulatory scheme. The agency in charge of administering the statute would typically have the expertise needed to understand the regulatory scheme and thus be able to create an accurate and digestible diagram. The diagram could then be promulgated as an interpretive rule; though the diagram would not always be required to go through notice-and-comment procedures, agencies would be well advised to use them, as the comments could be useful in making the diagram as accurate as possible.

The main benefit of this, as discussed below, would be the increased transparency of the law. However, because the diagram could exist before a case involving the statute’s interpretation came before the judge, the interpretive benefits described in Section III.A could also be captured if judges consulted the diagram. As the diagrams would have the force of law (particularly if they have gone through notice-and-comment), it is not too difficult to imagine both textualist and purposivist judges doing so.

2. Diagrams Increase Transparency

Theoretically, it is critical that statutes be understandable by citizens because “rudimentary justice requires that those subject to the law must have the means of knowing what it prescribes.” Legal rules must be transparent to those governed by them. Doctrines such as the rule of leniency and voiding laws for vagueness under due process exist to avoid

149. The situation would be a bit more complicated in cases when more than one agency is responsible for administering different parts of the statute. There would be a risk that a diagram created by any one of the responsible agencies may miss parts of the regulatory scheme the diagramming agency is not responsible for, which would undermine the diagram’s ability to facilitate creating a cognitive schema of the whole act. Agency-created diagrams may be less useful in those cases, but perhaps the Office of Information and Regulatory Affairs (OIRA) could convene the various responsible agencies to jointly create a diagram, as OIRA often does when multiple agencies must cooperate. See Cass R. Sunstein, The Office of Information and Regulatory Affairs: Myths and Realities, 126 HARV. L. REV. 1838, 1858-59 (2013).

150. Whether and when these judges would defer to the interpretations of the statute implied by the diagram is a critically important question. However, because the question is not unique to interpretive rules containing statutory diagrams, it is beyond the scope of this Note.

151. Scalia, supra note 105, at 1179.

152. See United States v. Canales-Amador, 837 F.3d 668, 674 (6th Cir. 2016) (“[T]he rule of lenity sets an outer limit, checking the tremendous power of the state by requiring it to act with a minimum level of clarity and transparency when it wishes to deprive people of their liberty.”).
the injustice of subjecting people to legal rules they cannot possibly know.

However, it goes without saying that ordinary citizens do not actually sit down to read and fully understand the statutes governing them. There are many reasons for this, but one of them is certainly the cognitive difficulty of reading a statute. Part of the motivation behind interpretive rules is to reduce the cognitive burden of understanding a statute’s requirements. Resolving ambiguities in a statute requires additional cognitive resources as interpreters must expend resources predicting how an agency or judge would interpret the statute. By clarifying how the agency will interpret the statute in advance, interpretive rules can eliminate the need to expend cognitive resources on that part of the interpretive task.

Because diagrams reduce the cognitive difficulty of understanding a statute, they can be more effective than textual interpretive rules at increasing transparency and understanding. Someone who sits down with a statute and its associated interpretive rules still has a cognitively demanding task before them. Understanding the statute would still require considering the context of the whole act, and textual interpretive rules would be unlikely to be any better at facilitating this than the text of the statute itself. An interpretive-rule statutory diagram, on the other hand, would aid that interpreter in their quest to understand the statute by aiding in schema creation. By reducing the cognitive load of understanding the whole statute, an interpretive-rule diagram would ensure that citizens, like ideal textualist judges, interpret the key provisions in context.

Putting the diagrams through notice-and-comment would augment agencies’ ability to create transparency in two ways. First, it would help create awareness of the diagrams; those who comment on the diagram would be made aware of its existence. Second, by engaging the public in designing the diagrams, agencies could create clearer and more accurate diagrams which would further increase transparency.154 In sum, as part of administering statutes, agencies are tasked with ensuring the statute’s requirements are transparent and understandable to those governed by it; statutory diagrams can be a tool for accomplishing that.

3. Bias, Ambiguity, and Agency Delegations

As with diagrams created by judges, there is a risk that diagrams created by agencies will bias the interpretation of the statute. Though in-

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interpretive rules are not formally binding, they often have a binding effect in practice, augmenting this risk. Notice-and-comment procedures, when used, can help eliminate some of these biases, particularly when the agency is acting apolitically, but it is possible that not every incidental bias implied by the diagram would be caught and commented on.

With all that said, if diagrams are only biasing the interpretation of a truly ambiguous statute, then this bias would not be a problem at all. This is because when a statute is truly ambiguous, courts consider it a delegation to an agency to resolve the ambiguity. So if the statute is genuinely ambiguous, and the diagram is biasing towards a reasonable resolution of that ambiguity, then that bias is not a problem; rather, it would be the manifestation of the agency exercising its delegated power to resolve the ambiguity.

The bias risk for agencies, then, only occurs when the statute is either not genuinely ambiguous, and the diagram creates ambiguity, or when the diagram is not a reasonable resolution of the ambiguity. This would be problematic; however, this problem is not unique to diagrams. Any interpretive (or legislative) rule could face this problem, and it is one that courts are well practiced at approaching within the Chevron framework. Therefore, though there is a risk that agency-created diagrams could bias interpretation, this risk is not as problematic as it is for judicially-created diagrams.

C. Diagrams as Legislatures’ Drafting Tools

Diagrams can be used by legislators to better draft statutes. They could be created by bill sponsors, committees, or by the Office of Legislative Counsel, and continuously updated as the bill is amended. Then, when the bill goes to the floor, the diagrams could be presented with the bill to legislators unfamiliar with the statute-to-be. The diagrams would then be part of the statute’s legislative history. Using diagrams in this way could help avoid drafting errors, which are increasingly common in the age of unorthodox lawmaking and can undermine statutes’ ability to effectively govern. With that said, there is a risk that diagrams used at the


157. When the statute is not ambiguous, or when the agency rule is not a reasonable interpretation of the statute, courts applying the Chevron test will not defer to the agency’s interpretation, and will invalidate it as unauthorized by the statute.

drafting stage could be strategically manipulated to win votes. Overall, using statutory diagrams at this stage may be the most high risk-high reward of all the proposals discussed in this Note.

1. Implementing Diagrams at the Drafting Stage

Statutory diagrams could be created for a work-in-progress bill prior to passage. These diagrams could be created by the staff of the bill’s sponsor as a way of explaining his/her vision, by the staff of the committee responsible for the bill as a way of explaining to legislators outside the committee how the bill functions, or by the nonpartisan House and Senate Offices of Legislative Counsel.

Each of these potential authors has their pros and cons. Sponsors and their staff may have the best sense of the vision of the statutory plan to be reflected in the diagram; however, their motivation to pass the bill could exacerbate the problem of manipulation discussed in Section III.C.3. A committee would have the most subject-matter expertise, which could be useful for fully understanding the whole act’s regulatory scheme, but in the age of unorthodox lawmaking, there may not be one committee well-positioned to diagram the whole act. The Offices of Legislative Counsel are central figures in the drafting of statutory text. This expertise, combined with their nonpartisan nature, might make them ideally positioned to accurately diagram the statute. However, those offices’ lack of subject-matter expertise relative to ordinary staffers could undermine their ability to understand the regulatory scheme.

Ultimately, however, the debate over the ideal author of the statutory diagram at the drafting stage, while an important one, can be put aside for purposes of this Note. So long as those responsible for drafting the bill, drafting the statute’s language, and ultimately voting on the bill are creating a work-in-progress diagram and consulting it throughout the legislative process, the core benefits and drawbacks are the same regardless of the diagram’s author. The working version of the diagram would incorporate changes to the statute’s language or structure as they were made. This is what would help drafters understand how each change to part of the bill affected the whole.

159. See BARBARA SINCLAIR, UNORTHODOX LAWMAKING 142-44 (4th ed. 2012) (discussing the increase in bills being referred to multiple committees).
160. See Gluck & Bressman, supra note 10, at 967-69.
162. See Gluck & Bressman, supra note 10, at 968.
Then, when the bill goes to the floor for a vote, the diagram could be presented to legislators seeing the bill for the first time. Because the diagram would reduce the cognitive load needed to understand the statute, it would help legislators voting on the bill understand it. If this helped legislators understand the bills they are voting for, this could increase the democratic legitimacy of legislation, particularly because there is not currently a strong norm of legislators reading a bill before voting on it. The diagrams would then be included in the legislative history of the statute.

Because the diagrams would be part of the statute’s legislative history, the benefits at the interpretive stage for purposivists, described in Section III.A.3, would also be captured; the benefits for textualists, who generally refuse to consult legislative history would likely not. The transparency benefits described in Section III.B.2 may also be accessed, depending on the extent to which those regulated by statutes read their legislative history. However, the main benefit of using diagrams at this stage is avoiding drafting errors. The mechanism for this is discussed in more detail below.

2. Improved Drafting

For a nation governed by statutes to be governed well, it is critical that statutes be drafted well. A sloppily-drafted statute, with internal contradictions, logical impossibilities, or imprecise language, will not be able to effectively remedy society’s problems, despite the legislature’s best efforts to do so. In part because modern statutes are so complex, it is not uncommon for a statute to have errors. The risks presented by drafting errors were highlighted by King v. Burwell.

At stake in King was the applicability of a tax credit central to the ACA’s regulatory scheme to the millions of Americans purchasing health insurance from federal, rather than state, exchanges. The issue was that Section 1401 of the ACA provided a tax credit for purchasing qualified health plans “which were enrolled in through an Exchange established by the State under [Section] 1311 of the Patient Protection and Affordable Care Act.” However, despite Section 1311 appearing to force states to


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create exchanges.\textsuperscript{168} Section 1321 allowed states to elect to have the federal government create “such exchange” for them.\textsuperscript{169} Thus, the question was whether “such exchange” established under Section 1321 counted as an exchange “established by the State under [Section] 1311.” If, as the challengers argued, it was not, and the tax credit was not applicable to taxpayers on federal exchanges, then people’s cost for healthcare would rise by an average of 287%.\textsuperscript{170} This increase in costs would mean that far fewer people would be required to purchase health insurance, because the requirement only applied when the cost of insurance was less than 8% of an individual’s income.\textsuperscript{171} Eliminating the individual mandate for this many people would cause the health insurance market on federal exchanges to enter a “death spiral[],” as healthy people would choose not to purchase health insurance, creating an adversely selected pool of sick people buying insurance.\textsuperscript{172}

The language in Section 1401 was likely a drafting error.\textsuperscript{173} Denying a tax credit to consumers on the federal exchanges would have undermined the entire regulatory scheme set up by the ACA. The fact that the legislative history is silent on the issue, combined with the lack of opportunity to clean up the bill prior to passage, further indicate that this was unintentional.\textsuperscript{174} Furthermore, the ACA is precisely the type of complex statute in which drafting errors are likely to occur.\textsuperscript{175} It certainly would have been preferable if Section 1401 just read “exchange,” as Section 1421 does,\textsuperscript{176} rather than “exchange established by the State under 1311.”

\footnotesize
\begin{itemize}
  \item \textsuperscript{168} \textit{Id.} § 1311(b) (codified at 42 U.S.C. § 18031 (2018)) (“Each State shall . . . establish an [exchange].”).
  \item \textsuperscript{169} \textit{Id.} § 1321(b)-(c) (codified at 42 U.S.C. § 18041 (2018)).
  \item \textsuperscript{170} \textit{See State-by-State Effects of a Ruling for the Challengers in King v. Burwell, supra note 166.}
  \item \textsuperscript{171} \textit{See King v. Burwell, 576 U.S. 473, 493-94 (2015); Affordable Care Act § 1501(b) (codified at I.R.C. § 5000A (2018)).}
  \item \textsuperscript{172} \textit{See King, 576 U.S. at 492.}
  \item \textsuperscript{173} To be clear, by saying it was a drafting error I do not mean to say it was a Scrivener’s Error which could be ignored as an absurdity. See SCALIA & GARNER, supra note 5, at 234-39. I just mean to say that the drafters likely did not intend to deny the tax credit to consumers on federal exchanges. Moreover, I emphasize that it was \textit{likely}, and not \textit{certainly}; unintentional. The alternative explanation, offered by Justice Scalia in dissent, that it was meant to “encourage States to establish their own Exchanges,” remains plausible. King, 576 U.S. at 514 (Scalia, J., dissenting).
  \item \textsuperscript{174} \textit{See Gluck, supra note 158, at 76-78; Mark Seidenfeld, Tax Credits on Federally Created Exchanges: Lessons from a Legislative Process Failure Theory of Statutory Interpretation, 99 MINN. L. REV. 101, 126 (2014).}
  \item \textsuperscript{175} \textit{Cf.} Timothy Stoltzfus Jost, Loopholes in the Affordable Care Act: Regulatory Gaps and Border Crossing Techniques and How to Address Them, 5 ST. LOUIS U. J. HEALTH L. & POL’Y 27 (2011) (discussing loopholes in the complex regulatory structure of the ACA).
  \item \textsuperscript{176} \textit{See Affordable Care Act § 1421 (codified at I.R.C. § 45R (2018)).}
\end{itemize}
Ultimately, the Court found that the whether the tax credit granted by Section 1401 could be applied to federal exchanges was ambiguous, in large part because of the Court’s willingness to examine the whole act,\footnote{177} and further held that the best resolution of the ambiguity, in light of the regulatory scheme of the ACA, was to apply the tax credit to federal exchanges as well.\footnote{178} So in this case, the drafting error ultimately did not undermine the regulatory scheme.

However, the Court’s approach in \textit{King v. Burwell} reflects the exception, not the rule. Generally the Court does not correct drafting errors.\footnote{179} For example, in \textit{Digital Realty Trust, Inc. v. Somers}\footnote{180} the Court found that even though applying Dodd-Frank’s narrow definition of a whistleblower\footnote{181} to retaliatory firing claims was “odd . . . peculiar . . . [and] probably not what Congress meant,”\footnote{182} because the statute’s definition was clear, it had to be applied.\footnote{183} Though representatives of both the legislative\footnote{184} and executive branches\footnote{185} filed amicus briefs advocating for the Court not to apply the definition to retaliation claims because it would undermine the statute’s purpose, the poor drafting of the statute could not be overcome.\footnote{186} “The Court was two votes away from doing the same in \textit{King}, highlighting the importance of avoiding drafting errors in the first place.

These drafting errors often arise from the incredible cognitive difficulty of tracking the various cross-references within the statute (or across multiple statutes, as in \textit{Somers}). The problem in \textit{King v. Burwell} was created by the interaction of less than ten sections spread throughout a stat-
ute containing hundreds, and the cognitive difficult of tracking these inter-
actions nearly broke the scheme.

Diagrams’ ability to reduce the cognitive load needed to understand a statute can help legislators and their staff draft better statutes. Because diagrams make it easier to form a schema of the work-in-progress statute, diagrams can increase the cognitive capacity available to identify mistakes. This would function similarly to diagrams’ ability to help people apply a statute after constructing a schema of it. Second, and more importantly, by making implicit logical implications more explicit, diagrams can dramatically reduce the cognitive difficulty of identifying unintentional implications of legislative language.187 Imagine the drafters of the ACA also created the following diagram prior to voting188:

187. See SHIMOJIMA, supra note 60, at 3-5. In some cases, diagrams make it impossible to express inconsistent information, which means that some contradictions in legislative language could not be diagrammed, making these mistakes more explicit. See id. at 7-8.

188. The following diagram implies that the majority’s decision in King v. Burwell was incorrect. However, there are certainly ways to diagram the ACA consistent with the Court’s interpretation (for example, by combining the federal and state exchanges into one box, merged by the words “such exchange”). The point here is not that the decision in King was either right or wrong, but rather that in either case a diagram would have clarified the correct interpretation both to the legislators voting on the bill and to judges willing to consult legislative history.
This diagram makes it much clearer that using the phrase "established by the state" in Section 1401 could be problematic. For one thing, the diagram reduces the cognitive difficulty of creating a schema of the ACA's regulatory scheme more than the text does. Moreover, the diagram makes it immediately clear that referencing Section 1311 could push the tax credit downstream of a state's election to establish an exchange, while the other key provisions of the regulatory structure (the individual, insured exchanges, etc.) remain intact.

Admittedly, this diagram is relatively cognitively difficult to understand. However, the difficulty pales in comparison to the difficulty of understanding the text of the nine sections reflected in the diagram.
mandate and guaranteed issue provisions) are upstream of that decision. This makes explicit the otherwise implicit problem that those on the federal exchanges would only be subject to two of the three key provisions of the ACA’s structure. Finally, the diagram draws attention to the structural implication of the variation between Section 1401 (individual tax credits), which refers to an exchange “established by the state,” and Section 1421 (small business tax credits), which just refers to “an Exchange.”

Had the drafters of the ACA used such a diagram, perhaps they would have seen the problem prior to the Act’s passage and changed the language of Section 1401 to mirror that of Section 1421, thereby eliminating the issue in King v. Burwell before the controversy arose.

3. Bias, Diagrams, and Political Manipulation

Diagrams created at the drafting stage would be part of the statute’s legislative history. This means the panoply of objections to using legislative history to interpret a statute once it has reached the interpretive stage would apply to diagrams as well. However, I do not intend on entering the legislative history fray at length here. Instead, I will focus on one criticism leveled at legislative history that I believe would be particularly important as applied to diagrams. According to this argument against legislative history, because legislative history is rarely actually consulted by legislators (that is, committee reports sit unread and floor speeches are given to empty rooms), and because it is neither voted on nor amendable, it may not reflect the judgment of the legislature as a whole.

Therefore, legislative history can be manipulated by legislators “who couldn’t get a majority for their statutory language,” in order to influence judges to interpret a version of the statute which would not have the votes to pass into existence.

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191. See id. § 1421 (codified at I.R.C. § 45R (2018)).
192. Sec. e.g., SCALIA & GARNER, supra note 5, at 369-91 (noting, among other criticisms, that using legislative history is likely to be akin to looking in a crowd and picking out your friends); ADRIAN VERMEULE, JUDGING UNDER UNCERTAINTY: AN INSTITUTIONAL THEORY OF LEGAL INTERPRETATION 107-15 (2006) (arguing that the volume and heterogeneity of legislative history increases the likelihood of mistakes given judges’ institutional constraints); Frank H. Easterbrook, What Does Legislative History Tell Us?, 66 CHI.-KENT L. REV. 441, 448-49 (1990) (arguing that using legislative history often shifts the level of generality from law-like rules to more nebulous values); John F. Manning, Textualism as a Nondelegation Doctrine, 97 COLUM. L. REV. 673, 710-25 (1997) (arguing that legislative history allows Congress to unconstitutionally circumvent bicameralism and presentment).
193. See SCALIA & GARNER, supra note 5, at 376.
Due to the risk that diagrams could bias the interpretation of an ambiguous statute, this criticism of legislative history could be particularly relevant. Say there is an ambiguously worded bill being considered by a legislature and that the regulatory scheme set up by one of the interpretations of the ambiguity has enough support to pass, but the scheme implied by the other does not. If a legislator, perhaps the bill’s sponsor or the committee chairman, favored the insufficiently popular regulatory scheme, they could leave the text ambiguous but create a diagram of the statute which implies their preferred resolution of the ambiguity. The diagram, if later consulted to interpret the statute, could then serve the manipulative goals of this legislator, subverting the will of the legislature as a whole.

This is a fair criticism of statutory diagrams at the drafting stage. Introducing a tool which could be manipulated for political reasons at an inherently political stage of a statute’s life does create a risk. There are, however, two mitigations of this criticism. The first is that because the diagrams are less cognitively demanding than not only committee reports and floor speeches but also the text of the statute itself, they may be more likely to be actually consulted by legislators than other legislative history. In fact, legislators may be more likely to read and understand the diagram than the text of the statute. If the diagram is being consulted by legislators as much as or more than the text of the statute, then it would be difficult for a Machiavellian diagram creator to use it to get legislators to vote for an interpretation they disfavor. The second is that, contingent on Offices of Legislative Counsel creating the diagram, diagrams could be created technocratically rather than politically. With that particular implementation of diagrams, the risk of manipulation is probably at its lowest.

**D. Diagrams as the Statute Itself**

The final way diagrams could be implemented is as part of the statute itself. Legislatures could enact something besides text into law, and include in each statute, as a Section 0 of sorts, a diagram outlining the overarching structure and rules of the statutory scheme.

This is admittedly a more radical proposal than the previous ones, and there are reasons to question how realistic it is to imagine legislators voting a diagram into law. The number of vetogates in the legislative pro-

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195. It is also conceivable that a diagram reflecting the interpretation creating the sufficiently popular regulatory scheme could be used by this sponsor or committee to convince the rest of the legislators that the ambiguity did not matter in the hopes of avoiding actually clarifying the text of the statute.
cess makes it very difficult to pass statutes.\footnote{See William N. Eskridge, Jr., \textit{Vetogates, Chevron, Preemption}, 83 Notre Dame L. Rev. 1441 (2008); McNollgast, \textit{Positive Canons: The Role of Legislative Bargains in Statutory Interpretation}, 80 Geo. L.J. 705, 720-21 (1992) (describing the vetogates a bill must pass through to become law).} Political coalitions are extremely fragile; one could imagine key votes being scared off by the newness of voting for a diagram, or by the clarity those diagrams can force.\footnote{See Victoria Nourse, \textit{Misunderstanding Congress: Statutory Interpretation, the Supermajoritarian Difficulty, and the Separation of Powers}, 99 Geo. L.J. 1119, 1133 (2011) (discussing how fragile coalitions push Congress to enact ambiguous statutes).}

However, the main reason diagrams are radical enough to scare off votes is simply that they have never been used before. Likely, then, diagrams being used at the other stages, particularly the drafting stage, could help acclimate legislators to the concept. Additionally, diagrams could initially be implemented for lower-stakes statutes with more broad-based support, or by state legislatures, as a way of easing into them.

The main virtue of enacting statutory diagrams into law is that all of the benefits discussed in Sections III.A-C would be captured. If the diagram is part of the statute a judge is interpreting, then they will reap the cognitive benefits as if it had been presented to them by a clerk or lawyer. Diagrams as part of a statute would increase the transparency of the law in the same way they would as part of an agency interpretive rule. If diagrams are part of the enacted text of the law, they would help drafters avoid mistakes just as they would if they were only part of the legislative history.

Moreover, and perhaps even more importantly, formally enacting diagrams into law completely eliminates the risk of bias. If the diagrams are created by the legislature and formally enacted into law, the diagram would not be \textit{biasing} the interpretation of an ambiguous statute; it would be \textit{clarifying} which resolution of that ambiguity is correct. Once part of the enacted statute, a diagram could not bias interpretation any more than a definition section could; it could not be used to manipulate legislators’ understanding of the law’s regulatory scheme, because they would in fact be the law’s regulatory scheme. It is never a problem if the legislature enacts something into law that clarifies an ambiguity; in fact, that type of clarity is central to both the rule of law and good governance. If a diagram which indicates that one interpretation of an ambiguity is correct is enacted, it would be doing exactly that.

IV. Some Conterarguments Considered

Part II of this Note empirically demonstrated the core benefit of statutory diagrams, namely their ability to reduce the cognitive difficulty
of understanding and applying a statute, and Part III discussed how statutory diagrams could actually be used to capture this benefit. As statutory diagrams are a new idea, my hope is that the combination of empirical evidence for diagrams and normative benefits that could result from using them have convinced readers they are a tool worth using.

As with any new idea, though, there are reasons for skepticism. The primary drawback of diagrams, empirically demonstrated in Part II and discussed throughout Part III, is the risk of diagrams biasing interpretation. There are, however, a few other reasons for skepticism worth discussion. I will focus on two broad criticisms of the idea of statutory diagrams: (1) diagrams, particularly when actually enacted into law, could introduce, rather than eliminate, confusion; and (2) diagrams may be unworkable for modern statutes.

A. Diagrams Might Introduce Confusion

Diagrams, skeptics may argue, could create confusion when they imply a different interpretation than the text of the statute. This creates the possibility that the diagram, rather than eliminating ambiguities in the text of the statute, could create a new ambiguity as to whether the diagram or text is controlling. Solving this problem could end up increasing the cognitive load required to understand and apply the statute, eliminating the core benefit of statutory diagrams.

However, this criticism is less concerning than it at first appears. First, it is only applicable to diagrams that are actually enacted into law; for every other use of diagrams, when the diagram and the text of the statute conflict, the text of the statute controls. Therefore, even a skeptic who thought this criticism made enacting diagrams risky could embrace using them as interpretive, communicative, or drafting tools.

Second, and more importantly, conflicts between the diagram and the text would be less difficult to resolve than it might seem. As the diagram would be a translation of the text, and not adding content, the confusion could not be over conflicting provisions. Rather, there are two types of conflicts that could emerge. First, they could conflict over details; the diagram may imply a generalization where the text has more detailed nuances. Second, they could conflict over structure; the text may imply a certain relationship between the statute’s rules that is not reflected in the diagram.

Understanding why each of these types of conflicts might occur makes it fairly clear whether the diagram or text would take precedence in either of these cases. If the conflict is about a detail, it is likely because diagrams, by nature, cannot capture every detail of the statute, so some details were lost in translation. In that case, the text, which is superior at capturing details, would control. Conversely, if the conflict is over the
statutory structure, it is likely because the implied structure from the text was not apparent to the drafters, because if it were, it would be apparent in the diagram, where it is much easier to reflect structure. In those cases, the diagram would control because it is the clearer indication of how the statute’s structure works best. Finally, a legislature enacting a diagram could also enact language indicating that the text should take precedence in a conflict, or vice versa.

**B. Diagrams May be Unworkable for Modern Statutes**

Up to this point, I have mainly discussed statutory diagrams depicting the entirety of the statute. Depicting the whole act’s regulatory structure is necessary for a diagram to provide directly a schema interpreters could adopt, which is a meaningful mechanism for diagrams to reduce the cognitive load of statutory interpretation. Skeptics could argue that this is only workable for statutes that are relatively short, relatively straightforward, and relatively self-contained, like the FAA and the WPR.

However, most modern statutes look much more like the ACA than the FAA and the WPR. They are significantly longer and more complicated, and often amend extant statutes rather than create new ones. Both of these factors—the complexity of modern statutes and the fact that many statutes amend a series of existing statutes—may make statutory diagrams, while theoretically appealing, practically unworkable. These are fair criticisms; it is true that statutory diagrams would work best for shorter and more self-contained statutes. However, I do not believe either of these criticisms proves fatal to statutory diagrams.

First, consider the criticism that most statutes are too complex to be diagrammed. The ACA, for example, covers 906 pages of the Statutes at Large, while the FAA covers five pages and the WPR six. While the empirical studies in Part II demonstrate that diagrams reduce the cognitive load for simpler statutes, perhaps diagrams of more complicated statutes would be too cognitively difficult to understand to make a difference.

This criticism misses the ability of statutory diagrams to facilitate schema creation at different levels of generality. Recall from Part I that complex schemas are built upon other simpler schemas; having a schema

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198. *See Outrageous Bills, supra* note 72. Notably, omnibus legislation is not necessarily complex in the same way, as each title of the bill can typically be considered its own statute for interpretive purposes.


of a sentence requires having schemas for phrases, words, and letters. Complex statutes have component parts, and understanding the whole act ultimately requires having schemas of those component parts. So even if statutory diagrams are unable to depict the whole act, they can still be useful for facilitating schema construction of subparts of the regulatory structure. Creating schemas of these subparts is as necessary to understand the whole of a complex statute as creating a schema of a word is to understand a sentence.

Figure 7, the diagram of part of the ACA, is an example of statutory diagram doing exactly that. The ACA’s regulatory structure involves many parts. The health insurance exchanges depicted in the diagram are one of these, but others (e.g., expanding Medicaid or various efforts to reduce healthcare costs) are also relevant to understanding the entire regulatory scheme, which could in turn be relevant for interpreting the language enacting those parts of the scheme. The diagram in Figure 7 does not depict the whole of the ACA, but it is nevertheless helpful for reducing the cognitive load of understanding part of the ACA’s scheme.

Moreover, there could be multiple diagrams at multiple levels of specificity for the diagram. While it would obviously eliminate important nuance, it is possible to diagram how the component parts of complicated statutes work together. The author of the diagram (be they a drafter, agency, or judge) could create one high-level diagram depicting the overarching structure of the act, and other more detailed diagrams depicting how the component parts of the structure work. Thus, while it is certainly true that statutory diagrams would work best for simpler statutes, they can still be useful for more complex statutes.

Next, consider the criticism that diagrams are unworkable for statutes which amend other statutes. Something like the phrase “Part A of Title X of the So-and-So Act is amended to read Z” can be commonly found throughout modern statutes. How then, if the statute is amending many different statutes with their own regulatory schemes, could diagrams be useful, a skeptic may ask.

This criticism, while valid, also does not render statutory diagrams useless, for two reasons. First, just because a statute is amending a myriad of other statutes does not necessarily mean that the statute is not enacting its own regulatory scheme that must be independently understood. The ACA again serves as a great example of this concept; in addition to enacting new law, the sections depicted in Figure 7 amended aspects of the

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203. Id. §§ 3001-3602.
Tax Code, the Public Health Services Act, and the Social Security Act. Though the ACA amended other statutory schemes, it also enacted its own scheme that requires an understanding separate from that of the amended statutes. Second, diagrams of the newly amended statutes could be created. While practically difficult to do at the drafting stage or as enacted law, this would not pose a particular problem for judges and agencies, who already need to interpret and communicate the law as amended.

Conclusion

The cognitive difficulty of statutory interpretation undermines people’s ability to accurately understand and apply statutes. This Note has proposed and explored a new tool for reducing the cognitive difficulty of understanding statutes: statutory diagrams. Because diagrams facilitate the creation of mental schemas, they can reduce the cognitive difficulty of understanding and applying a statute. The results of Experiment 1 empirically verify this theory and demonstrate that statutory diagrams actually do reduce the cognitive load required to understand and apply a statute. However, because diagrams can bias the interpretation of ambiguous statutes, those employing diagrams must do so carefully.

The cognitive difficulty of statutory interpretation affects every stage of the life of a statute. This means that there are a variety of ways the cognitive benefits of statutory diagrams can be leveraged. This Note has explored four such ways. Diagrams can be used by both textualist and purposivist judges to interpret statutes better; they can be used by agencies to communicate statutes better; they can be used by legislators to draft statutes better; and they can be enacted into law to make the law itself better.

The work presented in this Note, however, is just the start. It has not addressed every empirical question about diagrams, every potential use for them, nor every criticism that could be leveled against them. There remain many interesting questions about statutory diagrams that are great fodder for future research. For example, what differentiates clear and unclear diagrams, and what risks might accompany bad diagrams; do different substantive areas of law require different types of diagrams; would the ideological leanings of an interpreter change whether and how a diagram affects their interpretation; would people with no legal training benefit from statutory diagrams more, less, or the same? Hopefully, this
Statutory Diagrams

Note can serve as a launching pad for these and other questions, and will successfully help normalize the use of visuals in the textually-dominated field of law.

Appendix

A. Experimental Methods

1. Participants

Forty Yale Law students were recruited to participate in the experiment through an advertising email sent to the entire student body. While forty subjects is not the largest sample size, because the results, presented in Part II, were statistically significant, the sample is large enough to draw valid conclusions. The recruiting email mentioned reading statutes, but made no mention of diagrams, eliminating the concern that subject self-selection would affect the results.

Needless to say, Yale Law students are not a representative sample of the nation when it comes to their ability to interpret statutes. However, two factors obviate this problem. First, nothing about cognitive load theory indicates that diagrams would be more useful for a relatively expert sample. In fact, there is some evidence that just the opposite is true.207 While it is always better to have a more representative sample, research indicates this particular unrepresentative sample may not be problematic for generalizing the results to the entire population. Second, while it is important that all citizens be able to accurately interpret statutes, it is particularly important that the relative experts who usually give statutes practical effect be able to do so; therefore, at worst, the sample is representative of this critical subpopulation.

After completing the experiment, subjects reported their preexisting knowledge about the FAA and WPR. Any subjects with substantial knowledge of either statute were removed from the analysis for Experiment 1.208 However, all forty subjects were included in the Experiment 2 analysis.

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208. Ten subjects were removed.
2. Materials

Subjects completed the quizzes on Qualtrics. The text of the WPR, FAA, and the Parks Safety Act, as well as the diagrams were presented on paper to allow subjects to refer back to them during the quizzes. The diagrams are presented in Section II in Figures 1-6. The diagrams were designed to help subjects develop and apply mental schemas of each statutory scheme by presenting the statutes’ rules in a more easily processed manner and by highlighting the relationships between those rules, reducing the cognitive cost of understanding and applying the statute. Additionally, by providing a visual map of the statute, the diagrams could reduce the cognitive cost of searching for which section of the statute was relevant to a particular case.

The full text of the quizzes and the scenarios presented in Experiment 2 are reproduced below.

Federal Arbitration Act Quiz (Bolded Answers Are Correct):

1) Bob, a sailor who works on a boat that ships goods overseas has not been paid by the owner of the boat, Jim, who employs him, for over 6 months. Jim hasn’t been paying his employees because business has been slow and he wants to keep cash in reserve as a backup. Bob’s contract of employment specifies that he will be paid every month, and also specifies that the sailors will arbitrate any disputes they have with Jim. Bob sues Jim in federal court for breach of contract; Jim asks the court to stay the lawsuit so they can arbitrate. What should the court do?
   A. Stay the lawsuit and compel arbitration.
   B. Stay the lawsuit but do not compel arbitration.
   C. Have a hearing to determine whether or not there was an arbitration clause.
   D. Have a trial to determine whether Jim breached the contract.

2) Following a contractual dispute, Mary and Joseph go to arbitration, as specified by the arbitration clause. The arbitrator hears both Mary and Joseph’s story, and ultimately decides that Joseph breached the contract and awards Mary $3,500 in damages. However, Joseph is ad-

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209. Because the text is difficult to read in the PDF of the Statutes at Large, the text of the WPR was taken from the Avalon Project. War Powers Resolution, AVALON PROJECT, http://avalon.law.yale.edu/20th_century/warpower.asp [https://perma.cc/RZ9U-JDTY].

210. To avoid having the presentation of the statute confound the study, the text of the FAA was reformatted in the same style as that of the Avalon Project text of the WPR.
amant that the arbitrator got the decision wrong, and is refusing to pay Mary. Mary applied to the federal court for an order to confirm the award so that she could collect the money from Joseph. However, when the judge reviews the case, she becomes convinced that the arbitrator made the wrong decision. Although the judge did not notice any obvious procedural errors in the arbitration, bias on the part of the arbitrator, or mistakes that the arbitrator made, the judge feels certain that Joseph had not breached the contract. What does the FAA permit the judge do?

A. The judge can vacate the arbitrator’s award and order a new arbitration.
B. The judge can modify the award so that Joseph owes Mary less.
C. **The judge can’t do anything, and must confirm the award.**
D. The judge can vacate the arbitrator’s award and dismiss Mary’s case.

3) Kyle and Kathy sign a maritime contract for Kathy to supply Kyle with any rope he needs to operate his boat in exchange for a monthly payment of $200. They agree to put an arbitration clause in the contract, but do not contractually agree on any details beyond that they will arbitrate disputes. After a few months of doing business, Kyle misses a payment. Kyle claims Kathy did not deliver quality rope, but Kathy claims Kyle is simply refusing to pay for no reason. They want to arbitrate the dispute, but cannot agree on whether to have a single arbitrator or a panel of 3. They go to court to decide this issue. What must the court do?

A. **The court must name a single arbitrator for the dispute.**
B. The court must name three arbitrators for the dispute.
C. The court must split the difference and name two arbitrators, and provide for a second arbitration in the event of a tie.
D. The court must hear the case because the arbitration clause was not adequately detailed.

4) Jessie and James are from California and Oregon respectively; they contract for James to buy wine from Jessie’s vineyard. Because they want to guarantee an impartial arbitrator, they agree to arbitrate any disputes arising from their contract in Washington. The arbitration clause is very vague, and only specifies that they will arbitrate, with no other details. When Jessie delivers white wine, James initiates arbitration proceedings because he was expecting red wine. Since the contract specified Jessie would deliver red wine, the arbitrator awards James $1,500 in damages. James wants to have a court confirm the award. Which court does James have to go to?
A. The federal court in California, since that is where Jessie is from.
B. The federal court in Oregon, since that is where James is from.
C. **The federal court in Washington, since that is where the arbitration was.**
D. James can go to any of the above courts.

5) Sarah and Hannah are both software engineers designing apps. They met at a conference for entrepreneurs where each of them gave a presentation on their app. They realized that exchanging computer code could help both of them, so they formed a verbal contract to exchange files with one another. They also verbally agreed to arbitrate any disputes they had. Hannah returned to work and sent Sarah her files, but after a month Sarah had still not reciprocated. Hannah is now suing Sarah in federal court, but Sarah has asked the court to stay the case so they can arbitrate the issues. What should the court do?

A. Stay the lawsuit and compel arbitration.
B. Stay the lawsuit but do not compel arbitration.
C. Have a hearing to determine whether or not there was an arbitration clause.
D. **Have a normal trial to determine whether Sarah breached the contract.**

6) John, from North Dakota, formed a contract to buy 50 cartons of Lego’s from Jane, who is from South Dakota. John says that he specified that he wanted primary color Lego’s, but when Jane delivered the Lego’s, none of them were red. Jane says the contract did not specify that all the primary colors had to be represented, and that the contract had an arbitration clause. John says he didn’t sign an arbitration clause and does not know how it got in the contract. John sued Jane in Federal Court for breach of contract. However, Jane moved for the court to stay (meaning pause) the lawsuit and compel arbitration. According to the FAA, what should the court do?

A. Stay the lawsuit and compel arbitration.
B. Stay the lawsuit but do not compel arbitration.
C. **Have a hearing to determine whether or not there was an arbitration clause.**
D. Hold a normal trial to determine whether Jane breached the contract.

7) Alex and Sam are negotiating a contract for Sam to build Alex a cabin. After negotiations, they agree that Sam will build the house for the price of $400,000. They also agree that they will arbitrate any disputes about the agreement, and further agree that the judge can va-
cate the arbitrator’s award if he feels the arbitrator accidentally miscalculates the damages. In that case, the contract provides that the judge will order an entirely new arbitration. Sam installs the wrong kind of door, and Alex initiates an arbitration proceeding. The arbitrator determines that the cost of replacing the door is $4,000, but in the order for the award grants Alex $9,000 in damages. Sam refuses to pay because of this miscalculation, so Alex goes to federal court. What can the judge do?

A. The judge can vacate the arbitrator’s award and order a new arbitration.
B. The judge can modify the award so that Sam owes Alex less.
C. The judge must confirm the arbitrator’s award.
D. The judge can vacate the arbitrator’s award and order the arbitrator to award Alex $4,000.

8) After winning at arbitration, Jill goes to federal court to have a judge confirm the arbitral award against Jack. When she gets to court, she brings the award from the arbitration. She considered bringing her contract with Jack, but decides against it because she thinks that since the arbitration agreement and contract are not in dispute, it does not matter. When she goes to the court, what should the filing clerk do?

A. Accept Jill’s motion for the judge to confirm the award.
B. Decline to hear Jill’s motion until she files the contract.
C. Accept Jill’s paperwork and deny the motion because she forgot the original agreement.
D. Decline to hear Jill’s motion indefinitely.

9) A car factory has a contract with a dealership to deliver 25 cars per month that the dealership can then sell. Since the dealership is in the same state as the factory, ordinarily, federal courts would not have jurisdiction (and thus could not hear the case). However, the dealership and factory included an arbitration clause in their contract. One month, because of a fire in the factory, the factory could only deliver 20 cars. The dealership started an arbitration hearing, but the factory did not come. The dealership then sued and asked the federal court to order the factory to arbitrate. What should the court do?

A. Hear the motion and compel arbitration.
B. Dismiss the case.
C. Hear the motion and determine how much the factory owes the dealership.
D. Deny the motion.
War Powers Resolution Quiz (Bolded Answers Are Correct):

1) Because a dictator in a foreign country has credibly threatened to use chemical weapons to attack the United States, the President asks Congress to declare war. Congress declines to do this. It does, however, pass a statute authorizing the President to use military force to destroy the dictator's supply of chemical weapons. The President sends in troops to do this, but after they have been there for 55 days, the general in charge reports that they will need at least another month to complete the mission. What does the WPR require the President to do in this situation to allow the general to complete the mission?
   A. **The WPR does not impose any requirements on the President for completing the mission.**
   B. The WPR requires the President to certify to Congress in writing that unavoidable military necessity requires a 30 day extension of the 60 day deadline.
   C. The WPR requires the President to ask Congress to declare war.
   D. The WPR requires the President to tell the general to do his best in the remaining 5 days and withdraw troops at day 60.

2) How many days after the President introduces U.S. Armed Forces into hostilities does Congress have to introduce a joint resolution to extend the 60 day deadline?
   A. 30 days
   B. **32 days**
   C. 45 days
   D. 60 days

3) The United States is attacked by a foreign nation. The President immediately sends U.S. forces into that nation as a response, where they immediately are engaged in hostilities. As a result of the attack, Congress is unable to meet. After 60 days, what does the WPR require of the President?
   A. The President must certify to Congress in writing that unavoidable military necessity requires a 30 day extension of the 60 day deadline.
   B. The President must withdraw troops until Congress can meet.
   C. **The President can continue to use U.S. Armed Forces.**
   D. The President must seek a declaration of war from Congress.

4) The President has identified a small group of violent rebels operating a training camp in a foreign country. The President's intelligence reports that these rebels are a threat to the national security of the
United States, albeit a small one. The President sends in a small group of troops to eliminate the threat. The troops lay siege to the camp, occasionally exchanging fire with the rebels. Because it is a relatively small issue, Congress remains distracted by domestic issues and does not discuss the introduction of armed forces into this situation. After 90 days, when the President’s thirty day extension has elapsed, what does the WPR dictate in this situation?

A. The WPR allows the President to complete the mission with no other requirements.
B. The WPR requires the President to withdraw the troops unless Congress acts.
C. The WPR requires the President to report why it is necessary to continue to use military force to Congress.
D. The WPR requires Congress to either tell the President he can continue the mission or must withdraw.

5) Congress wishes to pass a concurrent resolution directing the President to remove U.S. Armed Forces from a foreign country. What is the maximum amount of time this process could take under the special procedures the WPR lays out?

A. 15 days
B. 36 days
C. 38 days
D. 60 days

6) Following some unrest in Eastern Europe, the President determines that it would be strategically valuable to send a three-star general, along with a small group of troops, to high level NATO command to monitor the situation. There is no expectation that the troops will be engaging in an exchange of fire with enemy combatants, but they are nevertheless equipped for combat as a security measure for the general. Which of the following must the President do, according to the WPR?

A. The President must consult with Congress before sending the general and troops abroad.
B. The President must withdraw the general and troops within 60 days, barring Congressional action or a 30 day extension.
C. The President must seek Congressional statutory authorization to allow sending the general and troops.
D. The President has no requirements under the WPR in this situation.

7) The President negotiates a treaty with the United Kingdom promising that if either nation declares war on another country, the other will join them in any military operations related to the war. The Senate ratifies this treaty. One year later, the U.K. declares war on a for-
eign country, and the President sends in United States Armed Forces to support them. Which of the below statements is false?

A. The President must, if at all possible, consult with Congress before introducing U.S. Armed Forces in the situation.

B. The President must report the circumstances necessitating the use of armed forces and the estimated scope and duration of involvement.

C. The President must withdraw U.S. Armed Forces after 60 days, allowing for a possible thirty day extension, unless Congress acts.

D. Because the Senate ratified the treaty, the President has a specific statutory authorization to use U.S. Armed Forces indefinitely.

8) What is the constitutional justification given for Congress having the power to force the President to withdraw U.S. Armed Forces after a period of time?

A. Congress has the power to declare war, so they can order the President to withdraw troops when they have not done so.

B. Congress has the power to appropriate money for the military, so they can condition appropriating the money on the President withdrawing troops.

C. Congress has all of the powers necessary and proper for carrying into execution all of the powers of the United States government.

D. Congress has the power to raise and support Armies, which empowers them to dictate how those armies are used.

9) In which of the following situations is the President required to consult with Congress before introducing U.S. Armed Forces into a situation?

A. The President is sending a small brigade of troops to a military base in a foreign nation. They are equipped for combat as a precaution, but there is no indication they will engage in combat.

B. The President is sending a fighter jet through the airspace of a foreign nation while equipped for combat.

C. The President is sending a surge of troops equipped for combat into a foreign nation, where United States Armed Forces are already present, but there is no indication they will engage in combat.

D. The President is sending a small brigade of troops to a military base in a foreign nation, where they are expected to engage in combat.
Park Safety Act Scenarios

1) A group of motorcycle enthusiasts drive through the park at 80 miles per hour.
2) A UPS truck driver cuts through a park to make a delivery on time.
3) A teenager skateboards in the park, doing tricks in a paved area.
4) A person rides their Segway into the park. It can only go 5 miles per hour.
5) A bicyclist puts on a BMX show in the park as street entertainment.
6) A person has a bicycle in the park, but they are pushing it in front of them.
7) A teenage couple is roller skating in the park.
8) A child rides her tricycle in the park.
9) Two parents bring a stroller with their toddler into the park.
10) A paralyzed man in a wheelchair comes into the park.
11) The park’s gardener rides a lawnmower throughout the park to mow the grass.
12) The park’s gardener rides a truck that he uses every day to maintain the park.
13) A woman has a heart attack in the park and an ambulance comes to get her.

3. Procedures

The survey instructed subjects that they would be taking quizzes about how statutes applied in various situations, and that they may have some additional explanatory materials (i.e., the diagram) for one of the statutes, but not the other. Subjects were also told that they would see their score at the end of the experiment to motivate them to answer the questions correctly.211

The statutes were presented in a random order to control for the possible effects of either fatigue diminishing performance or practice improving it.212 This randomization was independent of the randomization

212. It is conceivable that subjects would perform better on the first quiz because they were fatigued on the second quiz. It is also conceivable that subjects would perform better on the second quiz because they were more practiced at reading and applying statutes. However, there is no reason to believe that the magnitude of these effects would change depending on whether subjects had the diagram for the first and second quiz. Therefore, randomizing the order of the quizzes should have eliminated this potential confound. See PAUL C. PRICE, RAJIV JHANGIANI, I-CHANT A. CHANG, DANA C. LEIGHTON & CARRIE CUTCLE, RESEARCH METHODS IN PSYCHOLOGY 83-89 (3d Am. ed. 2017).
of the assignment of the diagrams. Subjects were given fifteen minutes to read whichever statute (and diagram) they were assigned to be quizzed on first. Subjects could not advance until all fifteen minutes had elapsed to discourage them from speeding through the survey without actually reviewing the materials. Following the fifteen-minute review period, subjects had twelve minutes to complete the quiz for the first statute. After completing the first quiz, subjects repeated these procedures for the second statute.

Because subjects completed a quiz both with and without a diagram, I was able to measure the effect of the diagram within individual subjects. There is some debate in the literature as to whether within-subject experiments, where each subject is exposed to both the control and treatment, or between-subject experiments, where each subject is exposed to only one condition, are superior.\textsuperscript{213} I selected a within-subject design because of its higher statistical power, inherent ability to control for subjects’ varying ability, and its closer alignment to the theory that a diagram should improve a single individual’s ability to understand and apply a statute.\textsuperscript{214} Moreover, in this particular experiment, randomizing the sequence of treatments adequately mitigated the disadvantages of within-subject designs.\textsuperscript{215} Finally, within-subject experiments are commonly used in the cognitive load literature.\textsuperscript{216}

After completing the second quiz, subjects immediately completed the task for Experiment 2. Subjects reviewed the Parks Safety Act and the associated diagram. Subjects then decided whether or not the statute was violated in each of thirteen scenarios. One of these, the attentional check, had an objectively correct answer based on the text; any subjects who responded that the statute was violated in that situation would have been removed from the analysis, but none did.

Following the completion of Experiment 2, subjects completed a debriefing form in which they reported any prior knowledge they had about the FAA and WPR and reported whether they found the diagram useful. After the debriefing was completed, subjects reviewed their score and were given their payment.

\textsuperscript{213} See, e.g., Charness et al., supra note 84; Anthony G. Greenwald, \textit{Within-Subject Designs: To Use or Not to Use?}, 92 PSYCHOL. BULL. 314 (1976).

\textsuperscript{214} See Charness et al., supra note 84.

\textsuperscript{215} See supra note 212.

B. Supplemental Results

Summary statistics for the two quizzes are presented below in Figure 8. Subjects performed better on the FAA quiz (median score of 67%) than the WPR quiz (median score of 56%). Subjects performed better on the FAA quiz both with diagrams (71% vs. 59%) and without the diagram (63% vs. 52%). This indicates that the difference was driven by either the WPR being more difficult to understand or by the quiz asking more complicated questions, and not by a difference in the usefulness of the diagrams.

Figure 8: Summary Statistics for the FAA and WPR Quizzes

Summary statistics of quiz scores broken out into the experimental and control groups are presented below in Figure 9. Subjects scored higher on the quizzes with the diagram (median score of 67%) than without the diagram (median score of 56%). Figure 10 shows the same data broken out by individual quiz question. The diagrams seemed to have a larger effect on some quiz questions than others, and for a small number of questions, subjects performed slightly better without the diagram. However, no clear pattern of which question types had the largest effect or a negative effect, indicating the differences were likely driven by randomness.
Finally, Figure 11 presents the distribution of time subjects spent on the quizzes. A plurality of subjects used the full time allotted (35%). More importantly, a de minimis number of subjects used the minimum amount of time allowed (7.5%), which might have been indicative of not fully attending to the quiz.
In order to confirm that the main result was not caused by decisions made about the regression analysis, I ran a series of alternative regressions, presented below in Table 3:
### Table 3: Robustness Checks

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<th>Dependent variable:</th>
<th>Quiz Score (%)</th>
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<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
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<tr>
<td>Diagram</td>
<td>0.098*</td>
<td>0.101***</td>
<td>0.077**</td>
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<td>(0.033)</td>
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<td>(N/A)</td>
<td>(N/A)</td>
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<td>-0.119***</td>
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<td>(0.029)</td>
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<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Male</td>
<td>-0.093</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.127)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Black or African American</td>
<td>0.523</td>
<td>(0.465)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.097</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.283)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.174</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.189)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>0.092</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.127)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In all three of the robustness check regressions, the main result remains directionally correct and statistically significant. The first robustness check (Column 1) removes all of the control variables except which statute was quizzed, and still shows a 9.8 percentage point improvement from the diagrams, significant at the 10% level. This shows that the result is not being improperly augmented by an over-fit model. The second robustness check (Column 2) adds demographic controls for age, sex, and race, and has nearly identical results to the primary regression; moreover, none of the coefficients for any of the demographic variables are statistically significant, removing another potential confound. Finally, the third robustness check (Column 3) includes the 10 subjects who were removed from the main analysis, and still shows the diagram improving quiz scores by 7.8 percentage points, significant at the 5% level. This shows that the subjective decisions made about whether to include or exclude particular subjects based on their self-reported prior knowledge did not drive the main result.

<table>
<thead>
<tr>
<th></th>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.606***</td>
<td>1.380</td>
<td>0.281</td>
</tr>
<tr>
<td></td>
<td>(0.045)</td>
<td>(1.505)</td>
<td>(0.435)</td>
</tr>
<tr>
<td>Observations</td>
<td>60</td>
<td>58</td>
<td>80</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.138</td>
<td>0.850</td>
<td>0.817</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.108</td>
<td>0.657</td>
<td>0.599</td>
</tr>
<tr>
<td>Residual Std. Error</td>
<td>0.204 (df = 57)</td>
<td>0.124 (df = 25)</td>
<td>0.130 (df = 36)</td>
</tr>
<tr>
<td>F Statistic</td>
<td>4.580** (df = 2; 57)</td>
<td>4.412*** (df = 32; 25)</td>
<td>3.748*** (df = 43; 36)</td>
</tr>
</tbody>
</table>

*Standard errors are reported below each coefficient in parentheses. *p*<.10, **p<.05, ***p<.01.*

217. An over-fit model is one in which there are too many parameters given the size of the sample, leading to the parameters appearing to be significant even if they are actually spurious. See generally KENNETH P. BURNHAM & DAVID R. ANDERSON, MODEL SELECTION AND MULTIMODAL INFERENCE: A PRACTICAL INFORMATION THEORETIC APPROACH 32 (2d ed. 2002) (describing the dangers of overfitting).