The Sincerest Form of Flattery: Examples and Model-Based Learning in the Classroom

Terrill Pollman

Introduction

Examples: Legal education is based on them in one way or another. In law school classrooms, students read judicial opinions—which are, of course, examples of how judges decide legal issues as well as examples of how lawyers make arguments—and trace backward to learn the lawyer's craft of legal analysis. When students are expected to write, whether writing exams, seminar papers, or practice documents for clinics or simulation classes, they crave examples, not only of opinions but also of good exams, pleadings, briefs, memos, contracts, client letters and other documents produced in the study or practice of law. This article will focus on how recent advances in cognitive load theory support the more intentional use of examples in law school course planning, textbooks and casebooks, and classrooms, especially when directed to novice learners. Further, it will conclude that in the current climate of rethinking the shape and value of legal education, cognitive load theory provides insight into how law teachers might improve legal education by employing different pedagogies to students at different stages of their law school careers.

Specifically, cognitive load theory suggests that novices learn more easily and better when teachers use examples. Similarly, composition theorists and cognitive theorists have collaborated to learn more about how to use examples to best teach writing to novices in a discourse community. Although legal scholars have begun to probe the impact of cognitive load theory on law and legal education[1], this article is the first to survey how cognitive load theory,

1.   Deborah J. Merritt, *Legal Education in the Age of Cognitive Science and Advanced Classroom Teaching*, 14 B.U. J. Sci. & Tech J. 39 (2008) (detailing how cognitive load theory applies to law school teaching, with a focus on cognitive load theory and use of media in the classroom); *see also* Stefan H. Krieger, *Domain Knowledge and the Teaching of Creative Problem Solving*, 11 Clinical L. Rev. 149 (2004); Hillary Burgess, *Deepening the Discourse Using the Legal Mind's Eye: Lessons From Neuroscience and Psychology That Optimize Law School Learning*, 29 Quin. L.R. 1 (2011); Larry O. Natt Gantt, II, *Problem Solving: Applying Cognitive Science to Teaching Legal Problem Solving*, 45 Creighton L. R. 699 (2012).

together with composition theory, supports using examples and models in the law school classroom.

Cognitive load theory "is concerned with the learning of complex cognitive tasks, in which learners are often overwhelmed by the number of interactive information elements that need to be processed simultaneously before meaningful learning can commence."[2] The theory explains how one's working memory is the limited part of cognitive functioning that we think of as "consciousness."[3] Because working memory is limited, it can become "overloaded" and impede learning.[4] Cognitive research has consequently examined ways of lightening the cognitive load on one's working memory to enhance learning, such as by using "worked examples and modeling examples."[5] When using worked examples, learners observe a written worked-out solution to a problem, and when using models, learners observe another person performing the task.[6]

Cognitive load theory explains much of what happens in the traditional law school classroom. Cases function as worked examples—a written worked—out solution to a problem. Law school professors function as models, giving students the opportunity to observe another person performing the tasks of reading, understanding and using a case instrumentally.

Cognitive load theory is especially important in classes where students write because, in addition to learning legal analysis, students are expected to perform simultaneously two learning tasks involving writing[7]. First, students must write a document; in the law school classroom it is a document that analyzes a legal question and demonstrates an understanding of the conventions of legal discourse. Second, students must generalize rules and procedures from the process of writing one document and transfer that generalized learning to the next document they must compose.[8] Ironically, although generalizing rules and procedures from the process of writing is most likely the task professors would identify as more important of the two, the students' grades are based

---

2. Fred Paas et al., *Cognitive Load Theory: New Conceptualizations, Specifications, and Integrated Research Perspectives*, 22 EDUC. PSYCHOL. REV. 115, 116 (2010).

3. John Sweller et al., *Cognitive Architecture and Instructional Design*, 10 EDUC. PSYCHOL. REV. 251, 252 (1998). Human beings are not directly conscious of long-term memory. Awareness of its contents and functioning is filtered through working (conscious) memory. *Id.* at 254.

4. John Sweller, *Cognitive Load Theory: Recent Theoretical Advances*, in COGNITIVE LOAD THEORY 29, 37 (Jan L. Plass, Roxana Moreno & Roland Brunken, eds., 2010).

5. Tamara van Gog & Nikol Rummel, *Example-Based Learning: Integrating Cognitive and Social-Cognitive Research Perspectives*, 22 EDUC. PSYCHOL. REV. 155, 156 (2010).

6. *Id.*

7. Martine A. H. Braaksma et al., *Effective Learning Activities in Observation Tasks When Learning to Write and Read Argumentative Texts*, 16 EUR. J. PSYCHOL. OF EDUC. 33, 34 (2001) [hereinafter Braaksma, *Effective Learning*]. *See infra* Part II.

8. Braaksma, *Effective Learning*, *supra* note 7, at 34 ("Learning to write requires the learner to become so closely involved in the writing process that hardly any cognitive energy is left for learning from that process.").

most often on the documents they produce. And confronted with two tasks, one of which earns a grade and the other not, students are much more likely to expend cognitive energy on the document that earns a grade and not on learning from the process. Cognitive load theory posits that composing imposes such a large cognitive load that it is difficult, perhaps impossible, for students to simultaneously accomplish the important task of generalizing principles to learn from the writing experience.[9]

Cognitive load theory is not without controversy or critics. One debate is between those who believe that people learn best in an unguided or minimally guided environment and those who believe novice learners need direct instructional guidance in a particular discipline.[10] Those who follow learning theories such as constructivism, problem-based learning, or experiential learning believe that knowledge is best acquired through experience, with students constructing their own solutions to problems typical to the discipline.[11] Cognitive load theorists, however, challenge these assumptions and posit that lightening the cognitive load by designing instruction with specific guidance is a better way to learn, at least initially.

Some critics have suggested that theorists should more deliberately balance between general and specific knowledge structures.[12] These social scientists suggest that instructional design should put more emphasis on generalized knowledge structures of "medium" generality that are essential for flexible expertise.[13]

Although recent scholars examining law school pedagogy have applied cognitive science, this article is the first to apply insights from cognitive load theory and that part of composition theory that addresses cognitive load to the law school classroom. The article argues law professors can better use examples to lighten the cognitive loads of their students to improve learning. To date, many professors have been reluctant to expand the use of examples

9.   *Id.*

10.   Paul Kirschner et al., *Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching*, 4 EDUC. PSYCHOLOGIST, 75, 86 (2006). Theories that emphasize unguided or minimally guided instructional approaches include: problem-based learning (which suggests students learn best through solving problems on their own), experiential learning (which suggests students learn more from experience), constructivist learning theory (which suggest students learn best by constructing their own learning) or discovery-based learning (which suggests discovering answers on their own promotes deeper student learning). *Cf.* Cindy E. Hmelo-Silver et al., S*caffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Clark*, 4 EDUC. PSYCHOLOGIST 99 (2007) (criticizing Kirschner et al. for lumping together too many distinct pedagogical approaches and noting that some approaches, specifically problem-based and inquiry-based learning, include extensive guidance).

11.   Kirschner et al., *supra* note 10, at 75.

12.   Slava Kalyuga et al., *Facilitating Flexible Problem Solving: A Cognitive Load Perspective*, 22 EDUC. PSYCHOL. REV. 175, 176 (2010). Flexible expertise is required by modern professionals who must effectively adapt to rapid technological changes. *Id.* at 175.

13.   *Id.* at 175-76.

or samples in the classroom, and, in part, with good reason.[14] When examples are not strategically constructed, novices respond to examples mechanically, with little nuance.[15] Cognitive research and composition theory, however, shed light on how to strategically construct examples and suggest that the benefits of using such examples have been overlooked. This article provides original analysis of how to apply these insights in law school instruction.

This article proceeds as follows. Part I of this article examines recent developments in cognitive science pertinent to using examples when teaching. In anticipation of applying cognitive load theory to the legal writing classroom by embracing examples, Part I also looks at composition theory literature on using examples in writing classrooms, some of which also uses theories about cognitive processes to explore what should happen when students learn to write. Part II applies this research to the law school classroom, focusing on ways to optimize learning in both traditional courses and those courses using more writing or simulation. Finally, the article concludes that using cognitive load theory principles to guide the design and staging of law school pedagogy can make learning both more efficient and deeper in all three years of law school.

I. Using Examples: Educational Psychology and Composition Theory

Gary Larson's unconventional comic series *The Far Side* examines human behavior, often through the lens of the animal kingdom.[16] The series has provided many insights applicable to the law school experience.[17] One popular panel depicts a classroom in which a student asks to be excused because his "brain is full." Recent advances in cognitive science and composition theory suggest that the "full brain problem" may be more than a clever observation about how students feel in the classroom. Instead, it may accurately represent a phenomenon in which attempting many sophisticated tasks at once can

14. Patricia Grande Montana, *Meeting Students' Demand for Models of Good Legal Writing*, 18 Perspectives 154 (2010), http://info.legalsolutions.thomsonreuters.com/pdf/ perspec/2010-winter-spring/2010-WinterSpring-13.pdf.

15. Without carefully designed exercises using examples, novices may focus on surface features rather than on deeper structural aspects. Joseph M. Williams, *On the Maturing of Legal Writers: Two Models of Growth and Development*, 1 J. Legal Writing Inst. 1, 2-10 (1991). Examples are less helpful if the new problem is slightly different from the example. Further, modeling with step-by-step instructions can cover more situations but can also be too isolated and abstract; *see also* Richard Catrambone, *The Subgoal Learning Model: Creating Better Examples So That Students Can Solve Novel Problems*, 127 J. Experimental Psychol. 355, 355-56 (1998)(suggesting that some of these problems can be addressed by segmenting examples and creating subgoals). *See infra* pp. 21-24.

16. Larson published his cartoons from 1979 until early in 1995. Gary Larson, http://www. princeton.edu/~achaney/tmve/wiki100k/docs/Gary_Larson.html (last visited July 6, 2014).

17. For example, a comic that works well for a class on large structural organization of a document depicts a sheriff talking to a cowboy about a terrific circular mess of cowboys and horses with arms, legs and cowboy hats. The caption reads: "And so you just threw everything together?...Mathews, a posse is something you *organize*." Gary Larson, The Prehistory of The Far Side: A 10th Anniversary Exhibit (2010).

make learning slow, difficult, and laborious. Educational psychology and instructional design provide insight into this phenomenon.[18]

This part examines the impact of cognitive load theory in the areas of educational psychology on instructional design and composition theory. First, educational psychologists specializing in cognitive load theory have developed a body of research that illuminates the best way to use examples and modeling when teaching. Next, composition theorists have also used cognitive load theory in the context of teaching writing, and teaching through writing, that can prove helpful for law teachers.

A. *Educational Psychology*

Cognitive scientists describe the architecture of the brain[19] as being made up of "working memory" and "long-term memory."[20] Working memory, sometimes used interchangeably with "short term memory,"[21] is the part of the brain that holds the information needed to complete complex tasks such as learning a language, analysis and reasoning.[22] In contrast to "long-term memory," which contains previously acquired information and is "effectively unlimited,"[23] working memory processes new information and is limited in the amount of information it can effectively process.[24]

Working memory and long-term memory work together when a student is faced with a new learning task.[25] Long-term memory is the basis for human understanding. In fact, "learning" can be defined as a "change in long-term memory."[26] Our level of performance is determined by the extent of our long-

18.   A 2009 study found that "cognitive load theory" was the second most used phrase in educational psychology and instructional design publications between 1980-2008. Z. Ozcinar, *The Topic of Instructional Design in Research Journals: A Citation Analysis for the Years 1980-2008*, 25 Australasian J. Educ. Tech. 429 (2009).

19.   "Human cognitive architecture refers to the manner in which the components that constitute human cognition such as working memory and long-term memory are organized." John Sweller, et al., Cognitive Load Theory 15 (2011).

20.   *See* Daniel Kahneman, Thinking Fast and Slow (2011)(exploring at length the difference between "working memory" and "long-term memory"). Kahneman uses the label "system 1" to correspond to long-term memory that works automatically and effortlessly. He uses "system 2" to correspond to working memory, which requires attention and is limited in the tasks it can simultaneously handle. *Id.* at 20-24.

21.   Although some distinguish between "working memory" and "short-term memory" the terms are often confused. Nelson Cowan, *What Are the Differences Between Long-Term, Short-Term, and Working Memory?* 169 Progress in Brain Res. 323, 323 (2008).

22.   Kahneman, *supra* note 20, at 20.

23.   Paas, *supra* note 2, at 116.

24.   *Id.*

25.   Sweller et al., *supra* note 3, at 252.

26.   Kirschner et al., *supra* note 10, at 75.

term memory, and how our long-term memory is organized into schemas that categorize problems and help us choose appropriate solutions.[27] Much depends on developing a large store of knowledge in long-term memory that we can use to solve problems. Further, because the common law system depends on building consistency by analogizing between decided law and emerging law, how lawyers build categories (in essence, schemas are categories) and use categories is at the core of legal analysis. Thus, understanding and facilitating how the working memory processes new information and develops and moves it into long-term memory is vital to promoting deep learning. The ultimate goal is to promote and facilitate schema acquisition.[28] Hence, structuring learning so as to avoid overtasking the limited working memory is important. This is the goal of cognitive load theory.

Professor John Sweller is credited with first identifying and developing cognitive load theory.[29] The roots of the theory, however, lie in a similar construct called "mental load," which dates to 1979. Mental load theorists examined "the difference between task demands and the person's ability to master these demands."[30] While mental load theory encompasses a multitude of factors such as motivation, training, stress, or ability, cognitive load theory focuses on how the characteristics of instructional materials affect cognitive load and thus affect learning.[31]

The triarchic theory of cognitive load categorizes cognitive load into three types: "intrinsic cognitive load"; "extraneous cognitive load"; and "germane cognitive load."[32] Intrinsic cognitive load represents the difficulty inherent in the materials the student is dealing with, and it cannot be altered.[33] Intrinsic cognitive load is generated when learning material requires the learner to hold many novel elements in working memory at once.[34] Intrinsic load is influenced

---

27. Paas et al., *supra* note 2, at 116.

28. Roxana Moreno & Babette Park, C*ognitive Load Theory: Historical Development and Relation to Other Theories*, in Cognitive Load Theory, *supra* note 4, at 9, 15.

29. Ruth Clark et al., Efficiency in Learning: Evidence-Based Guidelines to Manage Cognitive Load 1. (2006)

30. Moreno & Park, *supra* note 28, at 10. "The mental load construct is essential to the human factors science, which is concerned with understanding how human-specific physical, cognitive, and social properties may interact with technological systems, the human natural environment, and human organizations." *Id.*

31. *Id.* ("Other individual characteristics that are highly predictive of learning, such as cognitive abilities and styles, self-regulation, motivation and affect, are not considered within the CLT framework.").

32. Richard E. Mayer & Roxana Moreno, *Techniques That Reduce Extraneous Cognitive Load and Manage Intrinsic Cognitive Load During Multimedia Learning*, *in* Cognitive Load Theory, *supra* note 4, at 131, 132.

33. Sweller et al., *supra* note 3, at 259.

34. Mayer & Moreno, *supra* note 32, at 133.

by "element interactivity."[35] Learning elements that are interconnected—in other words, elements that must be learned simultaneously—imposes a higher cognitive load than learning isolated elements.[36] Many of the techniques developed by cognitive load theorists work best on material with a high level of intrinsic cognitive load.[37] This makes them especially applicable to law teaching.

Extraneous cognitive load, however, occurs when a student encounters poorly designed learning materials.[38] Extraneous cognitive load does not promote learning. Extraneous cognitive load is unnecessary and can be changed by designing better instructional materials.[39]

Germane cognitive load, like intrinsic cognitive load, is a necessary part of learning. It is the effort required to understand the materials used and thus incorporate the intrinsic load into the long-term memory schemata—sometimes moving it into existing schemas and other times further dividing, categorizing and creating new schema.[40] Thus, although not related to the inherent difficulty of the material, germane load occurs when instructional materials add to the difficulty, but there is a payoff for the effort. Germane cognitive load, as opposed to extraneous cognitive load, is relevant to the learning process. An increase of the germane load is justified by an increase in learning. Making cognitive load germane rather than extraneous, as happens when using well-designed instructional materials, benefits students.[41]

Although measuring cognitive load presents various difficulties, it is generally accepted that cognitive load can be measured.[42] And because extraneous cognitive load can be decreased with well-designed instructional materials, educational psychologists have focused on studying how the design and presentation of materials can affect cognitive load.

Cognitive load studies have primarily examined two areas of instructional design. Some theorists look at how multimedia presentation affects cognitive load.[43] Others focus on how much guidance instructional materials offer the

---

35. Sweller et al., *supra* note 3, at 259.

36. *Id.* Perhaps one reason law school imposes such a heavy cognitive load is understanding the interconnectedness of law. The usual metaphor of "a seamless web" springs to mind.

37. SWELLER ET AL., *supra* note 19, at 181.

38. Mayer & Moreno, *supra* note 32, at 133.

39. Sweller et al., *supra* note 3, at 259.

40. Mayer & Moreno, *supra* note 32, at 133.

41. Sweller et al., *supra* note 3, at 259.

42. *See, e.g.*, Tamara van Gog et al., *Uncovering Cognitive Processes: Different Techniques that Can Contribute to Cognitive Load Research and Instruction*, 25 COMPUTERS IN HUM. BEHAV. 325 (2009); Sweller et al., *supra* note 3, at 266-70.

43. Many studies focus on how to use graphics, text and audio. *See, e.g.*, Roxana Moreno & Richard E. Mayer, *Techniques That Increase Generative Processing in Multimedia Learning: Open Questions for Cognitive Load Research*, *in* COGNITIVE LOAD THEORY, *supra* note 4, at 153; Wayne

student, most often through models or worked examples.[44] Most of the work in the area of the writing classroom falls into the work on models and worked examples.

Although some educational psychologists study models and some study worked examples, the work is sometimes overlapping and distinctions are not always clear.[45] Nevertheless, in general, models and examples are an area that has generated many instructional techniques. Generally social-cognitive research is based on the idea that human beings learn from observing what goes on around them.[46] Thus, social cognitivists have primarily looked at guidance through "modeling," in which novice learners watch expert learners complete a task.[47] In contrast, the educational psychologists as cognitivists have focused on "worked examples," a step-by-step explanation of the solution to a problem.[48] It is commonly accepted among cognitive load theorists that presenting students with worked examples, the "worked example

---

Leahy & John Sweller, *Cognitive Load Theory, Modality of Presentation and the Transient Information Effect*, 25 Applied Cognitive Psychol. 943 (2011). In *Efficiency in Learning: Evidence-Based Guidelines to Manage Cognitive Load*, the authors identify principles for effective use of media that include: 1) how to use visuals and audio narration; 2) focusing attention and avoiding splitting attention; 3) minimizing redundant content and presentation modes; and 4) using performance aids to provide memory supplements. Clark et al., *supra* note 29. Professor Deborah Jones Merritt has addressed cognitive load and PowerPoint use in law school in an excellent article. Deborah Jones Merritt, *Legal Education in the Age of Cognitive Science and Advanced Classroom Technology*, 14 B.U. J. Sci. & Tech. 39 (2008).

44. Tamara van Gog & Niko Rummel, *Example-Based Learning: Integrating Cognitive and Social Cognitive Research Perspectives*, 22 Educ. Psychol. Rev. 155 (2010).

45. *Id.* at 155-57. Although cognitive theorists have focused on worked examples, and social-cognitivists have primarily focused on models, there are many commonalities between the two theories; some argue that worked examples are just a larger from of modeling. *Id.* at 156. In fact, some theorists suggest using heuristics that combine worked out examples and modeling. Tatjana S. Hilbert & Alexander Renkl, *Learning How to Use a Computer-based Concept-Mapping Tool: Self-Explaining Examples Help*, 25 Computers in Hum. Behav. 267, 268 (2009). This article will consider models and worked examples to function essentially in the same ways.

46. van Gog & Rummel, *supra* note 44, at 156-57. Social cognitive theory, also called "social learning theory," emphasizes the evolutionary importance of learning from what people do, say or write. Learning from observation is more efficient than learning everything from direct experience.

47. For example, one study tested whether learning to read or write by observing students reading or doing writing exercises was more effective than actually performing the exercises. The students in the learn-by-observation category were more effective at comprehending and analyzing texts than students in the learn-by-doing category. Further, the ability of students to transfer what they had learned to a new situation was enhanced, although the transfer effects were smaller in those who transitioned from reading to writing. The study's authors note, however, that learning by observation does have its limits because once a student acquires a skill learning is enhanced by applying it. Michel Couzijn & Gert Rijlaarsdam, *Learning to Read and Write Argumentative Text by Observation of Peer Learners*, 14 Stud. in Writing 241, 241-58 (2004).

48. van Gog & Rummel, *supra* note 44, at 155.

effect,"[49] is a superior learning technique compared with unguided problem solving.[50] Worked examples let learners "focus attention on problem states and associated operators (i.e., solution steps) enabling learners to induce generalized solutions and schemas."[51]

The worked example provides the learner with a problem-solving schema to transfer into long-term memory, facilitating future learning.[52] Cognitive scientist John Sweller notes that research on the worked example effect "leads to the counterintuitive prediction that studying worked examples may facilitate schema construction and transfer performance more than actually solving the equivalent problems."[53]

These results are strong in well-designed examples, but some have criticized the theory, claiming results are weaker when the examples are less well-designed.[54] "Well-structured problems" are problems that have specified procedures and rules for solving the problem.[55] "Ill-structured problems" are problems with less specified rules and procedures for solving the problem.[56] Recent research, however, has shown that examples also work well in those domains with ill-structured problems.[57]

Thus, although much of the research in the area of worked examples has been in "well-structured domains" such as the sciences or mathematics,[58] some studies have been done for learning argumentative skills and learning legal reasoning.[59]

---

49.   SWELLER ET AL., *supra* note 19, at 99 ("A *worked example* provides a step-by-step solution to a problem.").

50.   *See, e.g.*, Tatjana S. Hilbert & Alexander Renkl, *Learning How to Use a Computer-Based Concept-Mapping Tool: Self-explaining Examples Help*, 25 COMPUTERS IN HUM. BEHAV. 267, 267 (2009).

51.   Sweller et al., *supra* note 3, at 273.

52.   SWELLER ET AL., *supra* note 19, at 99.

53.   Sweller et al., *supra* note 3, at 273.

54.   Poorly designed examples can be less effective in some domains than problem-solving. For example, ineffective examples may split attention (requiring the learner to hold two separate examples in his head at the same time) or promote redundancy (where extraneous cognitive load is greater because the learner must analyze both to figure out that the examples are the same). Paul Chandler & John Sweller, *Cognitive Load Theory and the Format of Instruction*, 8 COGNITION & INSTRUCT. 293 (1991).

55.   SWELLER ET AL., *supra* note 19, at 102. An example of a "well-structured" problem would be application of a mathematical formula. An example of an "ill-structured" problem would be discussion of the meaning of a passage of literature. *Id.*

56.   *See, e.g.*, R.J. Spiro & M. DeSchryver, *Constructivism: When It's the Wrong Idea and When It's the Only Idea*, 106-23 in CONSTRUCTIVIST INSTRUCTION: SUCCESS OR FAILURE (S. Tobias & T. Duffy eds., 2009) (arguing that whether to use worked examples or problem-solving depends on whether the assignment is well-structured or ill-structured).

57.   SWELLER ET AL., *supra* note 19, at 102-03.

58.   van Gog & Rummel, *supra* note 44, at 158.

59.   Fleurie Nievelstein et al., *Expertise related Differences in Conceptual and Ontological Knowledge in the*

Most of the topics that arise in law school, and certainly law school writing assignments, are ill-structured problems. In fact, writing assignments of all sorts are ill-structured problems, but writing theorists have implicitly addressed the value of learning from examples and models for years—actually, centuries. They have also explicitly addressed cognitive load theory more recently.

B. When Students Write: Composition Theory, Cognitive Theory, and Examples

In the area of writing, both composition theory and cognitive load theory have shed light on how students learn from examples. Educational psychologists working in the writing pedagogy context suggest that teaching writing imposes special problems with cognitive load. Specifically, writing students expend so much of their mental energy on completing an assigned document that they have little to no mental energy left to reflect and learn from the writing experience itself, which would help them in future writing assignments.[60] The theory thus suggests that it may enhance learning and be more efficient for students first to work with samples, allowing students to focus on the task of generalizing principles from observing examples or models before attempting to write their own documents.[61] Those who teach persuasive writing, from rhetoricians in ancient Greece and Rome[62] to modern composition theorists who have collaborated with cognitive scientists,[63] have recognized the value of studying examples. Hence, both cognitive load theory and composition theory offer much to professors in search of the best way to use examples and models in the classroom.

Using examples is not new to teaching writing. From the early days of rhetoric in Greece and Rome, "imitation" of examples has been a standard teaching device.[64] This section examines how composition theorists have viewed using examples. It begins with a look at typical work on using examples from modern composition theorists in the classic rhetorical manner. The section then turns to how theorists combine the increasingly influential "process method" of teaching writing with "prose modeling," or using examples. Next,

---

Legal Domain, 20 Eur. J. Cognitive Psychol. 1043 (2008); Fleurie Nievelstein et al., *The Worked Example and Expertise Reversal Effect in Less Structured Tasks: Learning to Reason About Legal Cases*, 38 Contemp. Educ. Psychol. 118 (2013).

60. *See supra* note 8 and accompanying text.

61. Braaksma, *Effective Learning*, *supra* note 7, at 44 ("It seems that subjects who have learned by observation are able to handle the double agenda of task-execution and learning, and can learn complex skills more easily.").

62. *See generally* Edward P.J. Corbett & Robert J. Connors, Classical Rhetoric for the Modern Student (4th ed., 1999).

63. *See, e.g., infra* note 81, illustrating that composition theorist Linda Flowers worked with cognitive researcher, John Hayes.

64. Corbett & Connors, *supra* note 62, at 411 (4th ed. 1999). ("Classical rhetoric books are filled with testimonials about the value of imitation . . . . Rhetoricians recommended a variety of exercises to promote conscious imitation. Roman school children, for example, were regularly set the task of translating Greek passages into Latin and vice versa.").

the section looks at those composition theorists and cognitive scientists who have focused on writing from a cognitive viewpoint. Finally, the section looks at the conclusions of legal writing scholars on using examples.

1. Prose Modeling and Analyzing Examples

Edward Corbett and Robert Connor's popular text *Classical Rhetoric for the Modern Student* devotes an entire section to imitation.[65] In addition to a parade of testimonials to the power of imitation,[66] the text includes exercises for copying and imitating passages of admired works.[67] Also teaching imitation in the classic rhetorical style is Professor Frank J. D'Angelo, who notes the close connection between invention and imitation.[68] Making points that resonate with later work by the cognitivists, D'Angelo remarks that the student without examples has

> nothing to draw upon except his own meager store of stylistic resources and must, slowly and painfully, stumbling and fumbling, plot his weary way through all of the embryonic phases that are characteristics of an evolving style. The student who imitates, however, may be spared at least some of the fumblings of the novice writer.[69]

Using a passage from a short story by Irwin Shaw, "The Eighty Yard Run," D'Angelo describes the close work that fruitful imitation requires. The exercise is remarkable for the level of detailed observation required. Students must describe whether sentences are simple, complex, compound or cumulative; how many words are in sentences; how many base clauses or free modifiers are present; whether verbs are concrete and particular; how many participles are present; and the use of conjunctions.[70] When the analysis is completed, then the close imitation begins.[71]

Similarly, "prose modeling" is one of the approaches recommended in the classic *Eight Approaches to Teaching Composition*.[72] In that article from the 1960s,

---

65. *Id.*

66. *Id.* at 413-24. "Testimonies" from great thinkers and authors ranging from Benjamin Franklin and Winston Churchill to Malcolm X provide a colorful backdrop for the exposition on how to use imitation.

67. *Id.* at 424-83. Among other authors to be analyzed and imitated are Ecclesiastes, Daniel Defoe, Mary Wollstonecraft, Abraham Lincoln, Jane Austin, Henry James, Mark Twain, E.B. White, Ernest Hemingway, James Baldwin and Susan Sontag.

68. Frank J. D'Angelo, *Imitation and Style*, 24 C. Composition & Comm. 283, 283 (1973).

69. *Id.* at 283. When writing of a student who has few resources to draw on, D'Angelo is surely talking about using imitation to build schemas for students who have limited experience.

70. *Id.* at 284-88.

71. *Id.* at 288-89. Other theorists from the period suggested similar models, although sometimes on a simpler level. *See, e.g.*, James F. McCampbell, *Using Models for Improving Composition*, 55 The Eng. J. 772 (1966).

72. Paul A. Eschholz, *The Prose Models Approach: Using Products in the Process 21*, *in* Eight Approaches

the author suggests the method is more compatible with the new "process method" than one would expect at first glance,[73] and although he recommends "devotion" to the process,[74] he also expects students to read widely and learn to read as writers and use models in the revision process.[75] By the mid-1990s, composition theorists began empirical studies on effective "prose modeling" in combination with a "process approach". One study found that novice writers who study a model in an unfamiliar prose form respond in ways that are more like experts—that is, more introspective and evaluative—than novice students who are not given a model.[76]

Another study, of particular interest to law professors because it involved writing in a particular genre, examined using models to teach psychology majors how to write research reports.[77] Groups of undergraduates were given no models, good models, or a mixture of models of varying quality. Some students saw models with grades attached; others did not. All were subsequently asked to produce a "method section" for an experiment.[78]

Results were mixed. Significant differences emerged between two groups, the no-models groups and the groups with models with respect to both content and organization. The groups with models scored higher on organization than the no-models group.[79] The study also found no advantage to providing only good models or to labeling the models. Finally, the study concluded that providing students with models seemed to increase the value of the information students included in their own reports.[80]

Thus, composition scholars have engaged with "prose modeling" as a way of using examples. Some composition theorists have also specifically used cognitive psychology to examine the way we teach students to write.

TO TEACHING COMPOSITION (T.R. Donovan and B.W. McClelland eds., 1980).

73.   *Id.* at 27. "Although we now teach writing as a process, we no longer feel that it is in conflict with our use of prose models . . . . [I]f we are going to teach writing honestly, it is only fair that we look at what writers do and pattern our instruction after them." *Id.* at 29.

74.   *Id.* at 27.

75.   *Id.* at 35. Professor Eschholz recommends intervening with prose models at various stages of the process.

76.   Elizabeth A. Stolarek, *Prose Modeling and Metacognition: The Effect of Modeling on Developing a Metacognitive Stance Toward Writing*, 28 RES. TEACHING ENG. 154, 154 (1994).

77.   Davida H. Charney & Richard A. Carson, *Learning to Write in a Genre: What Student Writers Take from Model Texts*, 29 RES. TEACHING ENG. 88, 88 (1995).

78.   *Id.* at 92-96. For purposes of the study a model was defined as "a text written by a specific writer in a specific situation that is subsequently reused to exemplify a genre that generalizes over writers in such situations." *Id.* at 90.

79.   *Id.* at 111-12.

80.   *Id.* at 114.

2. Cognitive Science and Writing Theorists

In 1980, composition theorist Linda Flowers and cognitive scientist John R. Hayes collaborated on a groundbreaking article that changed the way theorists and teachers think about writing and teaching writing—*Cognitive Processes in Writing: An Interdisciplinary Approach*.[81] Hayes and Flowers used "think aloud protocols"[82] to identify the organization of the writing process. They replaced earlier theories about three distinct and linear stages of the writing process with a model that was more recursive, fluid and reciprocal. Hayes and Flower described how three "cognitive processes involved in writing (planning, translating and reviewing) interact *within the constraints of memory and the task environment.*"[83]

Although much of the composition theory literature has focused on other cognitive aspects of the theory, some social scientists who specialize in how to teach writing have examined "the constraints of memory," cognitive load, and using examples or models. For example, a group of Dutch theorists has developed a body of work on cognitive load and instructional design in the writing classroom.[84] These scholars identify the cognitive load problem that is specific to learning to write: that a heavy cognitive load is imposed by the process of "switching between carrying out the writing task itself and learning from doing so."[85]

Scholars address this problem, created when the learner must simultaneously execute the tasks of writing and the task of learning from that activity, by proposing solutions that center on using observational learning and models to lessen the cognitive load. In an early study involving learning to write argumentative texts, Michel Couzijn placed students in one of four categories:

81.   John R. Hayes & Linda S. Flowers, *Cognitive Processes in Writing: an Interdisciplinary Approach*, 24 Written Comm. 283 (1980). The article is viewed by some as the source of the "process model" of teaching writing. Others credit an earlier collaborative precursor, Linda S. Flower & John R. Hayes, *Problem-solving Strategies and the Writing Process*, 39 C. Eng. 449 (1977). Despite the fact that some composition theorists have declared that "the process model is dead," *see* Post Process Theory: Beyond the Writing-Process Paradigm (Thomas Kent ed., 1999), the notion of the "process model" continues to be influential in legal writing. *See, e.g.*, Linda H. Edwards, Legal Writing Process, Analysis & Organization (1999); Jo Anne Durako et al., *From Product to Process, Evolution of a Legal Writing Program*, 58 U. Pitt. L. Rev. 719 (1997) Teresa Godwin Phelps, *The New Legal Rhetoric*, 40 Sw. U. L. Rev. 1089 (1986).

82.   A "think aloud protocol" is a method researchers use in which readers model their cognitive processes by saying what they are thinking as they read a text.

83.   Vincent Connelly et al., *Children Challenged by Writing Due to Language and Motor Difficulties*, *in* Past, Present & Future Contributions of Cognitive Writing Research to Cognitive Psychology 217, 221 (Virginia Wise Berninger ed., 2012)(emphasis added). The authors note that although the Hayes and Flowers article proved to be the framework for future research in the field, theorists no longer believe that it explains all aspects of writing development. *Id.*

84.   Among others, these authors include Martine A.H. Braaksma, Hein Broekkamp, Michel Couzijn, Tanja Janssen, Marleen Kieft, Gert Rijlaarsdam, Huub van den Bergh, and Bernadette H.A.M. van Hout-Wolters.

85.   Braaksma, *Effective Learning*, *supra* note 7, at 34.

Group DW learned by doing writing exercises; Group OW learned by observing writers, Group OWR learned by observing writers and readers who evaluated the writers; and Group FW learned by doing a writing exercise and receiving feedback from a reader.[86] Students were pre-tested and post-tested on their ability to write argumentative texts and the "intermodal transfer" of this writing ability into reading the same type of texts. Students in both observational groups performed better on writing tasks than the students in the learn-by-doing categories; students in the observational categories also had stronger intermodal transfers to reading.[87] Interestingly, the observational writers who also had readers who evaluated the writers had the best intermodal transfer.[88]

Similarly, in a study using post hoc data gathered in the Couzijn study above, researchers identified which elements of observation tasks are effective.[89] This study confirmed the importance of monitoring, evaluative, and reflective activities in the observational process. The study found that "evaluation" and "product elaboration" were enhanced by observation of models. Although the researchers expected that students who learned by doing would engage in executive activities throughout the writing process, these students actually engaged in a more "plan-as-you-go" type of approach to the exercise.[90]

Among observational students, those with a "good model" showed more analysis activities ("text-structure-oriented" planning) while the "weak model" group used a more process-oriented planning. The authors concluded that observational learning, compared with learning by doing, enabled students to better cope with "the double agenda of task execution and learning" and more easily learn complex skills.[91] Later studies confirmed that observational learning helped students more for activities like planning. Further, the planning and organizing process of students engaged in observational learning was positively related to the quality of the writing product.[92]

86. Michel Couzijn, *Learning to Write by Observation of Writing and Reading Processes: Effect on Learning and Transfer*, 9 Learning & Instruction 109, 110 (1999).

87. *Id.* at 130.

88. *Id.*

89. Braaksma, *Effective Learning*, *supra* note 7, at 43.

90. *Id.* at 44.

91. *Id.*

92. Martine A.H. Braaksma et al., *Observational Learning and Its Effects on the Orchestration of Writing Processes*, 22 Cognition & Instruction 1, 2 (2004). "Orchestration" of the writing process is the term used to indicate "temporal organization." The term emphasizes that "writing processes must be activated and coordinated by a control structure, such as the monitor in the Hayes and Flower…model." *Id.* Further, note that "orchestration" is itself a process, so observing the process where observers focus and reflect on the process over the product might be expected to promote better understanding of the process for students. *Id.* at 4. Also worth noting is that the authors limited the participants in the study to those students who were considered good candidates for using "think aloud" protocols, which may mean the results of the study are not generalizable. *Id.* at 30.

In more recent studies, the Dutch researchers have examined observational learning with peers as models.[93] The researchers note that foundational assumptions include that writing and learning to write are "interdependent competencies."[94] It is not automatic that writing teaches one to write, but the design of the lesson must provide a frame and a space for students to act not as authors, but as learners. They must have a chance to observe process, to generalize and strategize about what counts as a successful piece of writing, and to think about what is necessary to produce one.[95] In this process students assume three roles: "writer-speaker," "reader-listener" and "learner-observer-researcher."[96] The authors suggest that those who teach should focus not only on the "writer-speaker" role, but also address the "learner-observer-researcher" role. They suggest a rule that each lesson should be aimed at least toward the learner role, but most should include other roles as well.[97]

Two conclusions related to examples in the writing classroom emerge from the study of peers observing peers. First, students who observed performed better when asked to perform the task themselves than students who had instructions and no model. Further, students who observed a model who made errors but gradually corrected the errors performed better than those who watched a model who performed the task perfectly the first time.[98]

The second conclusion is the "similarity hypothesis." The similarity hypothesis states that weaker students, or students with less prior knowledge, learn more from observing weaker models, and better or more experienced learners learned more observing good models.[99] In fact, good students did not benefit at all from focusing on weaker models.[100]

---

93. Gert Rijlaarsdam et al., *Observation of Peers in Learning to Write*, 1 J. of Writing Res. 53, 53 (2008).

94. *Id.* at 57. The authors analogize to learning to read and reading being interdependent skills.

95. *Id.* at 58.

96. *Id.* Compare Bryan Garner, Legal Writing in Plain English: A Text with Exercises 5-6 (2001) (describing the roles discussed in Betty S. Flowers, *The Flowers Paradigm: Madman, Architect, Carpenter, Judge: Roles and the Writing Process*, 44 Procs. Conf. C. Tchrs. Eng. 7 (1979). Both representations of the writing process acknowledge multiple roles for writers that include creating text, reading text, and criticizing text. Rijlaarsdam et al., however, add the role of *learner*, perhaps the most important role for legal writing professors to recognize. *See supra* note 93.

97. The relationship between reading and writing comes into play in studying the effects of observational learning between modes, (i.e. between learning to write and learning to read). In addition to other learning requirements in the writing process, writers must coordinate a variety of representations: What do I mean to say? What have I said? and How will various readers interpret what I have said? Thus, experiencing problems as a reader reading models may help a student become a better writer. Rijlaarsdam et al., *supra* note 93, at 71.

98. *Id.* at 67.

99. *Id.* at 68.

100. *Id.* at 69. The good students "needed the challenge of reflecting on the better model and explaining why the better model performed well." *Id.*

Similar to the studies in the Netherlands, in the United States Ronald Kellogg has described three ways in which authors represent source texts as the writers progress through various stages to maturity. In the first representation, the writer uses writing to tell what he knows. In the second, the writer transforms what he knows for his own benefit.[101] In the third, the writer transforms what he knows for the reader's benefit.[102]

Kellogg notes that "the limited capacity of the central executive of working memory" is the primary constraint on progressing through these stages or different types of "representations."[103] Similar to the Dutch scholars, Kellogg suggests the critical factor is the demanding load imposed on working memory by the writing process. This load limits both basic cognitive processes and progress of the writer though the representations.[104]

Kellogg argues that cognitive load can be lessened by creating "cognitive apprenticeships," in which learners practice and thus acquire "domain-specific" knowledge that can be retrieved more easily from long-term memory. [105] These "cognitive apprenticeships" have been explored in other instructional design science,[106] and these cognitive apprenticeships rely heavily on demonstration, modeling and observation in learning activities.[107]

3. Legal Writing Scholars and Examples

Legal writing scholars have also theorized on the use of examples. Some have endorsed comparing the strengths and weaknesses of model documents to learn the features of good writing.[108] Others have recommended following the educational maxim "I see and I remember, I do and I understand,"[109] or

---

101. Ronald T. Kellogg, *Training Writing Skills: A Cognitive Developmental Perspective*, 1 J. OF WRITING RES. 1 (2008). "In reading the text, the author builds a representation of what it [the text] actually says. At times such reviewing may lead to a state of dissonance between what the text says and what the author actually meant, but it can also become an occasion for re-thinking afresh the author's ideas. During knowledge transforming, the act of writing becomes a way of actively constituting knowledge representations in the long term memory, rather than simply retrieving them as in knowledge-telling." *Id.* at 7.

102. *Id.*

103. *Id.* at 3.

104. *Id.* at 5.

105. *Id.* at 3.

106. *See, e.g.*, Allan Collins et al., *Cognitive Apprenticeship: Teaching the Crafts of Reading, Writing and Mathematics*, in KNOWING, LEARNING & INSTRUCTION: ESSAYS IN HONOR OF ROBERT GLASNER (Lauren B. Resnick, ed. 1989).

107. Braaksma, *Effective Learning*, *supra* note 7, at 35.

108. Carol McCrehan Parker, Writing Throughout the Curriculum: *Why Law Schools Need It and How to Achieve It*, 76 NEB. L. REV. 561, 584 (1997).

109. Judith B. Tracey, *I See and I Remember; I Do and I Understand: Teaching Fundamental Structure in Legal Writing Through the Use of Samples*, 21 TOURO L. REV. 297, 309 (2005).

the medical school precept of "See one, do one, teach one."[110] The "seeing" in both cases refers to using examples and models to teach, and the analogy to other pedagogies in both cases supports a greater use of samples and examples in the legal writing classroom. Professor Laurel Oates has written that educational psychologists' studies demonstrate that pointing out the similarities in underlying structure of various examples will help students develop the schema necessary to transfer what they learn in one writing context to another.[111]

Still others have weighed the benefits and the costs of using examples. For example, Professors Shapo and Lawrence suggest that the costs of using examples in the legal writing classroom include students' following a model with "a dogged literal-mindedness regardless of subject matter and context."[112] The benefits include demonstration through providing multiple samples that there is more than one correct way to write a document.[113] Beyond using multiple examples, principles for using models effectively include discussing and annotating models of problems students have already tried to solve or asking students to create their own models of the various ways in which a document could be written.[114]

The traditional way legal writing professors identify error is through commenting on the students' own documents. Other legal writing teachers, however, have also explored the benefits of presenting students with weaker examples that feature mistakes common to beginners.[115] This method is similar to the method suggested by cognitive scientists who have found that novices who lack schemas often benefit more from seeing weaker examples and comments on the deficiencies of weaker examples.[116]

In summary, legal writing scholars have been ambivalent on the use of examples, recognizing both pros and con. Further, research in two areas, educational psychology and composition theory, have implications for how professors should use examples and models in the legal writing classroom. In

---

110. Christine N. Coughlin, et al., *See One, Do One, Teach One: Dissecting the Use of Medical Education's Signature Pedagogy in the Law School Curriculum*, 26 Ga. St. U. L. Rev. 361, 361 (2010) ("Because medical students and law students develop early professional reasoning skills in parallel ways, successful medical school pedagogy may be particularly applicable to the law school setting.").

111. Laurel Currie Oates, *I Know That I Taught Them How to Do That*, 7 Legal Writing Inst. 1,7 (2001).

112. Helene S. Shapo & Mary S. Lawrence, *Surviving Sample Memos,* 6 Perspectives 90, 90 (1998) http://info.legalsolutions.thomsonreuters.com/pdf/perspec/1998-winter/1998-winter-11.pdf.

113. *Id.*

114. Patricia Grande Montana, *supra* note 14, at 154.

115. Susan E. Provenzano & Lesley S. Kagan, *Teaching in Reverse: A Positive Approach to Analytical Errors in 1L Writing*, 39 Loy. U. Chi. L. J. 123 (2007).

116. *See* discussion *supra* pp. 19-21.

particular, the research suggests that teaching through examples is a superior model to problem-solving for novice learners. The principles developed by these theorists should guide legal writing professors as they expand their use of examples in the legal writing classroom.

II. Implications for Using Examples in the Classroom

The work of educational psychologists, experts in instructional design, and composition theorists presents several important implications for the use of examples in doctrinal and legal writing classrooms. First and foremost, the research supports that students who are novices in a genre or a discourse community will learn more quickly and more easily from examples and models.[117] The worked example effect has been reproduced in study after study. One of the most accepted principles of cognitive load theory is that using examples, worked examples and models to teach novices is superior to problem-solving techniques.[118] Further, the wisdom of classic rhetoric has been reinforced by the recent cognitive load theory research for teaching writing.

The research and theories examined also provide guidelines for when and how to use specific kinds of examples to maximize benefits at various stages of the learning process; how to structure or segment examples or models to minimize cognitive load; maximizing the benefits of examples through effective instructional design; and, finally, when and how to refrain from using examples. Many of the recommendations that grow out of the cognitive science and composition theory research are techniques and principles that some law professors have already adopted. Nevertheless, it will improve legal education to use these guidelines intentionally and more systematically to plan a law school course with the intent of reducing extraneous cognitive load. Similarly taking advantage of the strategies recommended by composition theorists working with cognitive scientists has improved and will continue to improve legal instruction, especially when it involves writing.

In the law school classroom, cases represent "worked examples" of legal problem-solving. They offer the chance to see how legal professionals have addressed and "solved" a legal issue. Law professors should recognize that reading and analyzing cases is schema-building in several ways. First, it expands the categorization of existing schemas. Thus, it offers an example of how a particular rule in a particular area of law works. ("This is how a lawyer addressing a torts problem decides whether *intent* is present.") Next, it builds new schemas. ("There is a concept called *standard of review* that addresses the level of deference an appellate court gives to a trial court.") And finally, and probably even more important, it gives students the chance to understand the *process* of reading, understanding and using legal authority instrumentally. ("It is important to note the level of the court and whether it is within my jurisdiction as I decide whether to use a case.") Law is ever evolving and the

117.   Sweller et al., *supra* note 3, at 273.

118.   Clark et al., *supra* note 29, at 190.

information students learn about a particular rule may change. Learning to read and use new cases and new rules is critical to becoming a successful attorney.

Cognitive load theory can guide choices for doctrinal classes and for legal writing classes, for novice learners and more experienced upper-division students, and for those creating the casebooks and other instructional materials for those classes. The effects, and the instructional techniques related to them, can be helpful in the various situations that law professors face: when designing texts, courses, or classroom instruction; when actually teaching in the classroom; and when considering the curriculum as a whole to design a sensible program of study as students advance.

The effects described below, and the techniques derived from them, are particularly applicable when designing texts, courses and classroom instruction using examples and models to teach law and legal writing.[119] Among those techniques that are most helpful when designing a text or a course are considering the prior knowledge of learners, segmenting the learning task, and considering variety in choosing cases and examples.

A. *Techniques Important as a Professor Designs a Course or Course Materials*

1. Consider the prior knowledge of students as you design the course. Use weaker examples with novices; use better examples as students' sophistication increases. Studying worked examples is more effective and efficient than problem-solving, especially for lower-prior-knowledge students.[120] Further, similarity in competence between the model and the observer may determine the effectiveness of observational learning.[121] In other words, students with low prior experience in the area or weaker students benefited more from observing weaker models and critiquing and analyzing weaker examples, while more advanced students learned best from more advanced examples, as well as from writing themselves.[122]

Thus, law professors should take into account whether a class comes in the first year of study, when deciding which examples and cases to use. Students with scant prior knowledge benefit most from examples and models.[123] Further, provide weaker examples at the start of the semester when students have less-developed schemas with which to view the example. For novices, examples

---

119.   Sweller collects and explicates many of these in a chart. Sweller, *supra* note 4, at 30.

120.   Ingrid A. E. Spanjers et al., *Segmentation of Worked Examples: Effects on Cognitive Load and Learning*, 26 Applied Cognitive Psychol. 352, 352 (2012).

121.   Martine A. H. Braaksma et al., *Observational Learning and the Effect of Model-Observer Similarity*, 94 J. Educ. Psychol. 405 (2002).

122.   *Id.*

123.   van Gog & Rummel, *supra* note 44, at 160.

of what *not* to do will help define the emerging schemas as much as correct examples.

In a study in 2002, Dutch researchers separated eighth-graders into weak learners and better learners.[124] Each group was subdivided and given either a competent or noncompetent example to aid them.[125] The results confirmed that similarity between the model and the model observer facilitated learning.[126]

This resonates with law schools' traditional pattern of teaching first-year courses that emphasize "case crunching," offering lots of chances to examine examples when students are novices. It also suggests that when choosing cases for the casebook or syllabus, choosing those cases that illustrate error—on the part of the current court, the lower court, or the lawyers in the case—is a sensible practice.

When the class includes writing, this guideline also resonates with the advice of legal writing scholars Provenzano and Kagan, who advise embracing error as a teaching tool. The "error analysis theory"[127] assumes a "stable of common errors . . . both logical and predictable." Creating examples that illustrate these predictable errors gives students the chance to learn from errors without the cognitive load involved in composition.

The corollary of this technique suggests that the type of example should change as students progress. For more experienced students, use examples that demonstrate almost none of the errors that are typical of beginners—fewer errors in general—and offer a variety of good examples to illustrate a specific skill. This is a technique that may be underused in law school. A casebook author may choose a case to illustrate excellent reasoning, lawyering or writing, but it is probably rare that casebook authors and professors choose to schedule such a case specifically when students are more ready to learn from it.

2. The segmented format and subgoal effects suggest that professors should pace learning by breaking learning goals into stages and providing subgoals for students as students examine models and examples. Creating a subgoal or segmenting a problem into distinct parts helps lessen cognitive load. Using a segmented format required less effort to achieve equal learning.[128] Segmenting in the form of creating subgoals for learners also aids students transferring problem-solving techniques from examples to slightly different problems.[129]

---

124. Braaksma et al., *supra* note 121.

125. *Id.* at 406.

126. *Id.* at 412.

127. Provenzano & Kagan, *supra* note 115, at 135 (citing Mina P. Shaughnessy, Errors & Expectations: A Guide for the Teacher of Basic Writing (1977)).

128. Spanjers et al., *supra* note 120, at 352. In contrast, requiring students to create segments on a worked example required students to "invest more effort in learning . . . without performing better." *Id.*

129. Richard Catrambone, *Improving Examples to Improve Transfer of Novel Problems*, 22 Memory & Cognition 606 (1994)[hereinafter Catrambone, *Improving Examples*]; *see also* Richard Catrambone, *The Subgoal Learning Model: Creating Better Examples So That Students Can Solve Novel*

Because intrinsic cognitive load is "fixed," segmenting the material to be learned is a way to help students handle intrinsically difficult material, or intrinsic cognitive load. [130] Further, breaking the material down to create subgoals not only marks a student's progress through difficult material, but it also builds schemas and aids transfer of skills to new projects.[131] "A learner is more likely to integrate new knowledge with the old if tasks are completed in small sections."[132]

Although some learning theorists have been enthusiastic about whole-task learning, there has been little research supporting it.[133] By contrast, research shows that designing the learning environment to confront students with whole-task learning imposes a greater cognitive load.[134] Thus, consider the risks of cognitive overload before designing the whole-task-learning environments. When whole-task learning is required, however, it often is most efficient if the assignment is a real-world task.[135]

In addition to teaching segments before teaching the whole, other principles that increase the efficiencies of segmenting examples or creating subgoals include designing learning environments that allow learners to control their own pace, and teaching supporting knowledge separate from the procedural components— for example, teaching the names and functions of the components before teaching the process.[136]

Segmenting and creating subgoals also requires estimating how to divide up the material to be learned. Research suggests organizing steps into a "meaningful hierarchical structure."[137] If segments are too small, too many components will overload the working memory; if the segments are too few,

Problems, 127 J. Experimental Psych. 355 (1998) [hereinafter Catrambone, *Subgoal Learning Model*].

130. Clark et al., *supra* note 29, at 162.

131. Sweller et al., *supra* note 19, at 205.

132. *Id.* Much of the research on segmentation has involved dynamic visualizations, such as animation or video, but others have applied segmentation to written text. *See* Spanjers et al., *supra* note 120. Segmenting text in a probabilities problem resulted in better outcomes with less cognitive load. Requiring the students to segment (a form of interactivity), however, was not as efficient. *See also* Catrambone, *Improving Examples*, *supra* note 129, at 607.

133. Clark et al., *supra* note 29, at 179. Most of the research into whole-task learning focuses on problem-based learning and involves studies that include traditional directive instruction. *Id.* Students sometimes experience more satisfaction with problem-based learning. *Id.*

134. *Id.* at 161.

135. *Id.*

136. *Id.* at 161, 173. It may seem counterintuitive to teach task steps separately from supporting knowledge, such as the reason a certain step is required. But understanding the concepts associated with the step may impose a heavier cognitive load and may be better achieved when the student has constructed schemas from learning the steps. *Id.* at 173.

137. Catrambone, *Subgoal Learning Model, supra* note 129, at 356.

the segments are too large and may lack a "clear function."[138] Experienced professionals are in the best position to divide the material; novices lack the experience to make these judgments. But it is wise to ask students for feedback, as students are in the best position to judge cognitive load for beginners.[139]

In the traditional classroom, it is probably obvious to professors that a syllabus is a map of segmented subgoals for the class. Students, however, may view the syllabus as a miscellaneous group of topics that fall generally under the heading of "Torts" or "Business Associations." Some professors regularly draw students' attention to the text's table of contents in an effort to provide context and cohesion to the students' view of the course. But the research suggests that professors go further by designing a syllabus that both intentionally names goals and subgoals for the course, and explicitly identifies these subgoals for students. Naming the knowledge and the skills that the professor expects the students to learn from a given assignment will help students control their own learning.

To create this kind of syllabus, professors must begin by identifying the goals of the course and then analyzing the steps or segments that students must complete to achieve a goal.[140] If analytical skills such as understanding a certain rule structure or recognizing the different skills involved in reading a statute compared with reading a case, then the professor should identify these goals and segment these lessons as part of the "doctrine" the course covers.

This area of cognitive load theory recommends other techniques for making the syllabus a teaching tool. Implementing the principle of separating the supporting knowledge from other components would suggest that students would profit from a glossary of terms they are likely to encounter in the course. Although definitions may perforce oversimplify concepts, a vocabulary list would provide a basis on which to build richer schemas over the duration of the course. It may also be sensible for a syllabus to contain "study questions" that students use while reading a case. The more that professors can develop "learning steps" as an explicit part of the course, the easier for students to internalize the basics and have a foundation on which to build deeper learning.

In simulation courses devoted to writing, segmenting and using subgoals has long been a part of employing what has been labeled "the process method" to teach writing.[141] Legal writing professors have replaced the whole-task method ("Here is what a memo contains; now you write one.") with a

---

138. Clark et al., *supra* note 29, at 167.

139. *Id.*

140. The current emphasis on assessment advocates the same process of creating a class "backward" by deciding the learning goals or outcomes, and then working backward to decide how students will accomplish the outcomes and how professors will assess whether the outcomes have been achieved.

141. *See, e.g.*, Jessie Grearson, *Teaching the Transitions*, 4 J. Legal Writing Inst. 57, 62 (1998); Ellie Margolis & Susan L. DeJarnatt, *Moving Beyond Product to Process: Building a Better LRW Program*, 46 Santa Clara L. Rev. 93 (2005).

list of segmented tasks that essentially create subgoals (writing pieces of the whole such as a research log, an outline, lists, notes or a zero draft). Professors changed the teaching method to focus on the process of writing and to create opportunities for intervention in the writing process.[142] The information derived from cognitive load research on subgoals and segmenting not only drives that process and supports that practice, but also suggests ways of extending it in any class where students write.

Writing courses could be more intentional about using segmenting by teaching the vocabulary of the writing task before teaching the components of the task. Examples work at every stage of the writing process from planning and pre-writing to revising and editing. Segmenting planning and pre-writing also works to not only improve the planning stage, but also the final product.

Regarding student control over pacing of the segments, in some sense the law school tradition of delaying evaluation until the end of the semester, with one final exam, allows students to decide how fast they will learn the material. The trouble with that notion, however, is that the syllabus demands a relentless march through the material. Those students who are less sophisticated in metacognition, less self-directed or less self-disciplined, however, may fail to take this as opportunity to pace their own learning and more likely procrastinate or careen from one task to another in triage mode. When one concept builds on another, law professors need teaching techniques that allow both professors and students to assess whether students are ready to move on. Several techniques can help with that assessment.

Classroom assessments such as "minute papers," "muddiest point," "problem recognition tasks," and "one-sentence summaries" can help professors assess students' progress without imposing large blocks of time or grading duties in the middle of the semester.[143] Using instant feedback

---

142. Writing professors typically stage assignments to create opportunities to intervene. Some of the common stages might be research plans, source lists, outlines, zero drafts, first drafts, conferences, reflection papers or writer's memos, all leading up to a final draft. *See generally* Linda L. Berger, *Applying New Rhetoric to Legal Discourse: The Ebb and Flow of Reader and Writer, Text and Context*, 49 J. Legal Educ. 155 (1999).

143. These techniques and many others that could be helpful are from Thomas A. Angelo & K. Patrician Cross, Classroom Assessment Techniques: A Handbook for College Teachers (2d ed. 1993). The "minute paper technique" suggests professors stop class a minute or two early and ask students to write for one minute on a topic such as "What is the most important thing you learned in class tonight?" *Id.* at 148. One advantage of minute papers is that if they are used regularly, students pay better attention in class, knowing they will need information for the minute paper. "Muddiest point" is similar, but asks for a quick response to the question of what they are finding difficult in the material. *Id.* at 154. A "one-sentence summary" asks students, "Who does what to whom, when, where, how and why?" about a given topic, and then asks them to synthesize those answers into a single informative, grammatical, and long summary sentence. *Id.* at 183. "Problem-recognition tasks" are essentially issue-spotting opportunities generated by giving students a page of situations and asking them to spend a few minutes spotting the issues. Less complicated than full practice tests, they nevertheless give students a chance to see if they can begin to recognize the issues discussed in class. *Id.* at 214.

techniques that involve the entire class, such as clickers or a low-tech version such as holding up colored cards, can help professors see how much of the class is ready to move on, as well as offer students the chance to see if they need to devote extra attention to the class to stay with the majority of students. And office hours or mandatory conferences with students may offer special opportunities for individual assessment. Writing teachers have traditionally used individual conferences to help students self-assess and self-pace.

Further, many legal writing professors now use "live conferencing" and "zero drafts," which may offer students the chance to pace their own learning.[144] At "live commenting conferences," professors read and react aloud to students' writings that the professor is reading for the first time. Live conferencing gives students the chance to hear how a trained legal reader reacts to their written analysis in real time. Professor Linda Berger suggests that "zero drafts," or drafts that students usually create or their own benefit and that fall somewhere between notes and outlines, "help a writer begin writing at a time when she is unlikely to be able to form the complex concepts required to create an integrated network of large and small ideas."[145] In other words, Professor Berger sees zero drafts as a technique to help students manage cognitive load. Allowing students the freedom to determine how much will be included in the zero draft gives them control over the pace of their own learning.

3. Variability matters more in worked examples than in problem-solving, so carefully choose how to vary examples. When students see multiple examples that vary in context but demonstrate the same principles, the students are better able to construct flexible schemas that identify the core features of the principles and to dismiss those that are irrelevant.[146] The variability effect is a function of germane load, and not intrinsic load, and implicates the concept of "transfer." Transfer is "the use of knowledge or a skill acquired in one situation to perform a different task."[147] In other words, although giving students various examples imposes a greater cognitive load, that load is justified and relevant—germane load rather than extraneous load. After all, if the only goal were to lighten the cognitive load, it would be light indeed if students could just study the same example over and over. But adding to the relevant load by varying context to encourage transfer demonstrates the concept of germane load.

Thus, the varietal effect is counterintuitive because it suggests increasing the cognitive load of some assignments.[148] The varietal effect recommends

---

144. Several legal writing colleagues who use "live conferencing" leave students in control of how much text they will bring in for the conference. These professors may also allow students to schedule more than one conference as the students work their way through the memo.

145. Berger, *supra* note 142, at 175.

146. Sweller et al., *supra* note 3, at 286.

147. Oates, *supra* note 111, at 1 (citing Nancy Penington, Robert Nicolich & Irene Rahm, *Transfer of Training between Cognitive Sub-skills: Is Knowledge Use Specific?,* 28 Cognitive Psychol. 175, 176 (1995)).

148. Sweller et al., *supra* note 3, at 287. "The results of studies on variability initially seemed to

increasing the germane cognitive load to increase the likelihood of transfer by giving students a variety of examples. Students learn more and transfer more by studying highly variable examples rather than examples with more similar features.[149] Variability is more effective with worked examples than in the problem-solving format.[150]

One study suggests that the kind of variety may matter when using multiple examples. The researchers grouped the examples according to surface features—for example, putting all finance problems or force problems together, or according to structural features, putting all examples that are solved using the same rule together.[151] When novice learners were given the examples, the grouping emphasizing surface features enhanced performance more than structural groupings.[152] The researchers reasoned that putting together problems that look the same but are structurally different teaches learners how to identify the important structural features and ignore irrelevant surface features. When experts were given the examples, however, the enhanced effect disappeared. Thus, once learners can distinguish structural features, they simply need practice and the specific type of examples matters less.

When variability is low and deep structure is constant, learners learn only to solve problems with a particular structure. In contrast, when variability is high, with a corresponding high interactivity of elements, students "must take into account more and more elements associated with the various structures reflected in the problems and learn how to deal with those elements."[153]

These results argue for course designers and textbook authors to consider carefully both what they wish students to learn and the nature of cases used to teach those analytical skills and doctrinal content. When choosing cases to study, look for more than an illustration of a key concept; consider also structural versus surface features and the number of interactive elements. Increasing the number of interactive elements may provide more learning,

---

contradict cognitive load theory. High variability increased cognitive load during practice but yielded better transfer of learning, indicated by a better ability to diagnose faults that were not practiced before." *Id.* Other studies similarly note that the load is germane and "if intrinsic cognitive load requires fewer cognitive resources than are available in working memory and the number of interacting elements relevant to the task can be increased, then learning will be enhanced by increasing the cognitive load." SWELLER ET AL., *supra* note 19, at 212.

149.   SWELLER ET AL, *supra* note 19, at 163.

150.   *Id.* at 214.

151.   *Id.* at 163 (citing Katerina Scheiter & Peter Gerjets, *Making Your Own Order: Order Effects in System-and User-controlled Settings for Learning and Problem-solving, in* IN ORDER TO LEARN: HOW THE SEQUENCE OF TOPICS INFLUENCES LEARNING 195-212 (F. E. Ritter et al. eds. 2007)).

152.   SWELLER ET AL., *supra* note 19, at 163-64.

153.   *Id.* at 215.

but only if the student has sufficient working memory to accommodate the increased cognitive load.[154]

The task professors face is optimizing interactivity and variation to increase learning while not overloading the working memory and shutting down learning. Here, as above, the prior knowledge of the learner will often govern how much a professor can expect students to balance. Beginning students are less equipped to learn from cases with highly interactive elements. One technique, "pre-training" involves developing a specific knowledge for students before presenting multifaceted materials.[155] In another form of segmenting goals, professors can design study questions or subtopics to introduce sophisticated concepts before expecting students to learn them in tandem with other concepts.

In classes that produce written products, the varietal effect, using more than one example or examples with multiple facets, has long been recognized as beneficial. If one of the problems of giving writing students an example is the students' tendency to follow it "slavishly" without thinking, one common solution is to give students multiple examples that illustrate the same principle in different ways.

Applying these lessons of recent studies, however, suggests that professors make intentional choices to offer students examples in one area, but provide different rule structures or call for different organizational schemes. For example, it might make sense to pair examples from criminal law, but with each example illustrating a different rule structure. Or, as students advance, it may be most important for them to see different topics repeating familiar structures. You could do this by offering one example from criminal law and one from tort law that both illustrate a rule with elements. In writing classes, research findings do not support using just one topic for assignments or examples throughout the semester.

Among the legal writing professors who have advised a variety of contexts are Professor Laurel Oates, who wrote about how best to encourage transfer of skills from one assignment to another, and Professor Carol Parker, who wrote about the best way to use examples in writing to learn in law school classrooms.[156] Professor Parker notes, "A student who has been accustomed to relying on intuitive understanding and a good ear may reach the limits of those gifts in law school. In any event, a good ear is only as good as what it has heard."[157] The observation is especially apropos for novice students and indicates the need for a variety of samples and models.

---

154. *Id.*

155. *Id.* at 204.

156. Oates, *supra* note 111; Parker, *supra* note 108, at 583-84.

157. Parker, *supra* note 108, at 584.

B. Techniques Especially Helpful During Class Times

1. The self-explanation technique. Students learn from examples when they attempt to explain to themselves why certain steps are taken in a solution.[158] Self-explanation involves both generating inferences from the material and fitting those inferences into the individual student's own schema or model.[159]

Researchers in the late 1980s discovered that if an example did not spell out the necessity for each step in the solution, students would shoulder the burden of explaining to themselves the reasoning involved.[160] When students engaged in this "self-explanation" they appeared to learn more and to transfer more.[161] Further, students who were successful problem-solvers monitored their own learning and created more and better explanations.[162] But if students were not prompted to generate self-explanations, they either generated superficial explanations or did not self-explain at all.[163]

According to Ruth Clark et al., "[a] self-explanation is a mental dialog that learners have when studying a worked example that helps them understand the example and build a schema from it."[164] The self-explanation effect was not developed as a part of the cognitive load framework, but it can be explained using cognitive load theory concepts.[165] Researchers have theorized that the reason self-explanation enhances learning is that students engaging in the process revise and expand their current schema to accommodate the new example.[166] More self-explanation results in more learning.[167]

158. Michelene T. H. Chi et al., *Self-Explanations: How Students Study and Use Examples in Learning to Solve Problems*, 13 Cognitive Sci. 145, 181 (1989)("We believe . . . students learn . . . via generating and completing explanations."). *Contra* Spanjers et al., *supra* note 120, at 357 (stating that interacting with learning material does not always positively affect learning).

159. *See* Michelene T.H. Chi, *Self-explaining Expository Texts: The Dual Process of Generating Inferences and Repairing Mental Models, in* Advances in Instructional Psychology: Educational Design and Cognitive Science 161, 183-97 (R. Glaser ed. 2000)(describing the process of generating inferences before undertaking revision of one's own mental model).

160. Chi et al., *supra* note 158, at 149. ("However, in order to successfully learn from these types of examples, the learner has to actively explain the solution steps to himself or herself because not all the information about the rationale of the solution steps, that is necessary for understanding the solution procedure, is included in the examples."); *see also*, Alexander Renkl, *Learning from Worked-Out Examples: A Study on Individual Differences*, 21 Cognitive Sci. 1, 1 (1997) (citing Chi et al., *supra* note 158).

161. Chi et al., *supra* note 158, at 151 (describing a study where researchers instructed undergraduates to create explanations when none were provided for a worked example).

162. *Id.* at 168.

163. *Id.*

164. Clark et al. *supra* note 29, at 226-27.

165. *Id.*

166. Chi et al., *supra* note 158, at 149.

167. Clark et al., *supra* note 29, at 227. In one study using a worked example in physics, better learners generated on average 15.5 self-explanations per example compared with 2.75 from poor learners. *Id.*

Although students may have an individual self-explanation style,[168] the research indicates that self-explanation can be taught.[169] Designing examples to include questions that prompt the student to self-explain has been effective. Prompts are questions that ask students to respond in a specific way that requires self-explanation.[170]

Three kinds of self-explanation have been studied and found helpful: "1) monitor and correct; 2) try and check; and 3) make inferences by associating the examples with underlying principles or prior knowledge."[171] "Monitor and correct" involves asking students to identify those parts of the example that they don't understand and then to seek ways to reconcile their understanding.[172] In contrast, the "try and check" method asks learners to read the worked examples with the solution steps hidden and then to attempt to solve a problem. The learner next checks the steps in the solution he or she has created with the suggested steps.[173] Finally, "inferencing" asks the learner to self-verbalize new connections between parts of the example, or between prior knowledge and the examples.

Research on self-explanation suggests that in addition to using a variety of examples[174] and "fading completion exercises,"[175] you can promote deeper learning by training learners to self-explain worked examples in small classroom sessions.[176] Professors promote this deeper learning by illustrating and discussing effective self-explanations, asking students to practice and then using teacher and peer feedback to improve self-explanations.[177] Professors should also regularly remind students to self-explain.[178]

168. Renkl, *supra* note 160, at 21-22. Renkl posits that there are four self-explanation styles, two of which are more successful. *Id.* at 21. He classifies successful learners as "anticipative" or "principle-based" learners. *Id.*

169. Alexander Renkl et al., *Learning from Worked Examples: The Effects of Example Variability and Elicited Self-Explanations*, 23 Contemp. Educ. Psychol. 90, 90 (1998). This study focused on bank apprentices learning to calculate interest. *Id.* Researchers trained one group of apprentices by giving them a good example of self-explanation, which was followed by a practice assignment. *Id.* The trained group produced twice as many self-explanations as the group without training. *Id.* Note that this comports with the notion that self-explanation is a matter of giving the student a chance to resolve inconsistencies between existing and new schemas.

170. Michelene T. H. Chi et al., *Eliciting Self- Explanations Improves Understanding*, 18 Cognitive Sci. 439, 443 (1994). "Prompted students developed a correct model more often than unprompted students." *Id.* at 467.

171. Clark et al., *supra* note 29, at 228.

172. *Id.*

173. *Id.*

174. *See supra* pp. 15-16.

175. *See infra* pp. 21-22.

176. *See* Clark et al., *supra* note 29, at 231.

177. *Id.*

178. *Id.*

Within the legal academy, several learning strategies mirror self-explanation. As noted earlier, analyzing cases is in many ways like using a worked example. Written opinions are the outcome and record of the steps taken by both lawyers and judges in cases. The opinion may not always set out steps involved in making a decision, but professors, through strategic questions that act as prompts, ask students to self-explain the solutions the court sets forth. The professor's questions challenge students to reconcile new information concerning law and legal processes with the students' existing schemas. The result is that students use examples of acceptable arguments to create new schemas to accommodate new concepts.

Several scholars have explored the internal dialogue that typifies the methods with which lawyers and law students read the opinions that serve as examples.[179] Some have suggested that a successful strategy is to "talk back" to the text,[180] which may be seen as a way of self-explaining. Another approach advocated, in addition to asking students to "question and evaluate the texts that they read," is that professors should model this process of explaining and interrogating the text during the class period.[181]

Other law school pedagogies that are analogous to self-explanation include encouraging self-reflection in order to help students become lifelong learners.[182] A technique addressed specifically to the legal writing classroom that would work well with seminar papers or any class using writing to learn is offered by Professors Kearney and Beazley, who have suggested that students write a "private memo" to the professor that explains the choices they made while writing the assignment.[183] Further, Kearney and Beazley suggest that professors comment on papers by asking questions, rather than making comments, analogous to the prompts used to encourage self-explanation.[184]

Thus, the utility of self-explanation has not been lost on law school professors. But once again, thinking intentionally about using the principles of cognitive load theory to design examples with prompts for self-explanation could increase the efficacy of law school, and specifically legal writing, practice. Although little has been done to encourage law professors to explicitly train

---

179. *See, e.g.*, Ruth Ann McKinney, Reading Like a Lawyer: Timesaving Strategies for Reading Law Like an Expert (2d ed. 2012); Leah Christensen, *The Paradox of Legal Expertise: A Study of Experts and Novices Reading the Law*, 2008 B.Y.U. Educ. & L.J. 53 (2008); Laurel Currie Oates, *Leveling the Playing Field: Helping Students Succeed by Helping Them to Learn to Read as Expert Lawyers*, 80 St. John's L. Rev.227 (2006).

180. *See* Elizabeth Fajans & Mary R. Falk, *Against the Tyranny of the Paraphrase: Talking Back to Texts*, 78 Cornell L. Rev. 163 (1993).

181. Laurel Currie Oates, *Beating the Odds: Reading Strategies of Law Students Admitted Through Alternative Admissions Programs*, 83 Iowa L. Rev. 139, 160 (1997).

182. *See, e.g.*, Richard K. Neumann Jr., *Donald Schon: The Reflective Practitioner, and the Comparative Failure of Legal Education*, 6 Clinical L. Rev. 401 (2000).

183. Mary Kate Kearney & Mary Beth Beazley, *Teaching Students How to Think Like Lawyers: Integrating the Socratic Method with the Writing Process*, 64 Temple L. Rev. 885, 894-97 (1991).

184. *Id.* at 900.

students in self-explanation, the three kinds of self-explanation researchers have found helpful provide a road map to creating exercises that encourage students to self-explain. Rather than expecting students to figure out for themselves what they should be learning from reading a case, professors could guide students into self-explanation by supplying study questions that students would answer *before class*, and thus students would come to class ready for a group discussion on key steps in the analysis.

Using the "monitor and correct" technique, professors could ask students to identify the parts of an opinion they find most problematic, and to write two or three short explanations that reconcile the reasoning with the student's understanding of the area of law. The "try and check" method, meanwhile, suggests the "problem-solving" method that some texts currently use. Professors could supply students with a set of facts and ask the students to write an opinion, thus asking students to provide for themselves the steps in the analysis. To complete the exercise, the professor would provide the opinion the court actually wrote and ask students to compare their work with the court's work. Finally, using "inferencing," professors would create study questions that ask students to verbalize the connections between parts of the opinion, or between the new opinion, and prior opinions the class has read.

Studies suggest self-explanation training often occurs best in small group settings,[185] and often the legal writing classroom and seminars may be the only small classroom settings that novice law students encounter. Professors should design assignments involving examples that include prompts for self-explanation in the three ways described above.[186] Moreover, in small classrooms professors should explicitly model good self-explanation techniques—both when reading legal texts and when reading examples of practice documents. Encouraging self-explanation will aid students not only in producing better documents, but also in producing better learning in their law school experiences.

2. The goal-free questions technique. Asking learners to accomplish a certain goal, such as finding an element or creating a document, creates a great cognitive load because students must often complete a complex task to solve the problem. Asking generalized questions instead, such as "what principles can you extract from this problem," imposes less cognitive load than looking for a certain answer. Asking goal-free questions helps to build the scaffolding needed to lighten cognitive load for completing the entire task.[187]

"Goal-free questions" are those seeking a nonspecific answer.[188] Goal-free questions used with worked examples produce more learning than goal-

---

185. CLARK ET AL., *supra* note 29, at 231.

186. *Id.* at 228.

187. Paul L. Ayres, *Why Goal Free Problems Can Facilitate Learning*, 18 CONTEMP. EDUC. PSYCHOL. 376, 377 (1993).

188. SWELLER ET AL., *supra* note 19, at 89. An example of using a goal-free question in the geometry domain would be asking student to find "as many angles as you can" rather than "calculate

specific questions.[189] Later overshadowed by the worked-example effect,[190] the goal-free effect was one of the first techniques identified by educational psychologists working in a cognitive-load framework.[191] Further, researchers have found the goal-free effect works with the worked-example effect.[192]

Researchers arrived at the theory by noticing that when asked to solve a problem, novices will often work backward from the goal.[193] Experts, on the other hand, have developed schemas that allow them to work forward because they are able to categorize a problem and then use the steps appropriate to that problem to reach a solution.[194] This process mirrors what actually happens in many law school classes. Students spend the semester working backward from decided cases to reconstruct the steps in the decision-makers used to create the outcome. By the end of the semester, in final exams, we expect students to have developed the schema that will allow them to work forward from a fact pattern to making arguments and naming outcomes.

Because novices don't have that schema in place, asking goal-directed questions increases cognitive load as students work backward, trying and rejecting options in order to find a path that works.[195] "In contrast, by creating a goal-free environment, learning is not dominated by strategies to connect a goal to the givens."[196]

In the law school classroom, goal-free questions solve the problem of playing "guess the exact phrase that the professor has in mind." It makes more sense to require the skilled expert, a professor, to manipulate the information a student provides in the answer to a goal-free question into schema-building material than to require student novices to manage two tasks at once: exploring alternative paths to the specific "correct answer" and drawing the general principles from the process to build the needed new scaffolding in memory.

In experiential learning, simulations and writing classes, Donald Schon's work on reflection and expertise has influenced many clinicians and legal writing teachers to ask goal-free questions that ask students to reflect on their experience.[197] Thus, in addition to asking goal-free substantive questions in the classroom, goal-free questions are most likely to appear in reflective memos or "private memos" that many professors assign to accompany experiential or

---

angle ABC." *Id.*

189. *Id.*

190. *Id.* at 98.

191. *Id.* at 89.

192. *See, e.g.*, Craig S. Miller et al., *Goals and Learning in Microworlds*, 23 Cognitive Sci. 305 (1999).

193. Sweller et al., *supra* note 19, at 89.

194. *Id.*

195. *Id.* at 90.

196. *Id.* at 90.

197. Donald Schon, The Reflective Practitioner (1983); Neumann, *supra* note 182.

simulation assignments.[198] The goal-free question effect is a reminder to ask open-ended questions that encourage exploration on part of students. Thus, goal-free questions are especially appropriate in reflection papers and in using examples in the classroom.

3. The completion problem technique helps students pay close attention to examples. When students fail to carefully study worked examples, they may lose the worked-example benefit. One exercise that helps ensure that students focus adequately on the example is the completion problem.[199] "Completion problems," as John Sweller et al. note, "are problems for which a given state, a goal state, and a partial solution are provided to learners who must complete the partial solution."[200] Completion assignments occur when the professor gives students a partial solution to a problem and asks a student to complete the problem.[201] With a completion problem, students need not hold both the problem and the worked examples in their heads at same time, which imposes a large cognitive load.

The completion problem technique is related to segmenting the problem or modeling segments of a process. Essentially, completion problems are another way of segmenting information to ease cognitive load because students may focus on a single aspect of a multipart question.

Completion problems have been underused in the law school classroom. "Study questions" in a text, teacher's manual or the course supplement are all forms of completion problems that currently appear in law school classrooms. Too often, however, these questions are designed to encourage students to think of the big philosophical questions in an area of law, rather than the concrete steps students need to master in order to develop a skill or solve a problem. Making sure, however, that these aids provide examples that are segmented and targeted at specific learning goals would increase their utility.

4. In classes that focus on writing, create exercises that separate the learning process from the composing process. Cognitive scientists who focus on teaching writing have emphasized the importance of seeing the composing process and the learning process as separate functions.[202] The greater cognitive load likely occurs from problem-solving in two arenas at once rather than being able to focus cognitive resources on one question at a time.[203]

---

198. *See* Linda Berger, *Applying New Rhetoric to Legal Discourse: The Ebb and Flow of Reader and Writer, Text and Context*, 49 J. Legal Educ. 155, 178 (1999); Kearney & Beazley, *supra* note 183.

199. Jeroen J.G. van Merrienboer et al., *Taking the Load Off the Learner's Mind: Instructional Design for Complex Learning*, 38 Educ. Psychologist 5, 7 (2003).

200. Sweller et al., *supra* note 3, at 275.

201. *Id.*

202. *See supra* pp. 9-10.

203. John Sweller, who has done many of the groundbreaking cognitive load studies, also identified this effect when looking at the research on goal-free questions. Sweller et al., *supra* note 19, at 90.

Professors in classes that emphasize writing can best address the problem by viewing each student as two separate entities: 1) "the writer student" who must focus on composing a document that meets the standards of the class and the discipline; and 2) "the learner student" who must focus on discovering the general principles embodied in a particular assignment but must be transferred to the next problem the student faces. Professors should create assignments that will address the "learner student" as well as creating assignments for the "writer student."

An example of an assignment that addresses "the learner student" might ask the student to examine two or three separate samples of text describing a precedent case. The instructions would ask the students to identify the features of each, and to explain in their own words why the feature is effective or ineffective. Notice that the professor is not yet asking the students to compose text describing a precedent case, but rather to analyze closely the examples.

C. Techniques Should Change to Fit the Changing Needs of Students as They Progress in Law School

Cognitive load studies suggest that students' learning needs change as they advance. Three techniques in particular, "the expertise reversal effect," "the guidance facing technique," and "the "redundancy effect," support law schools paying more attention in designing a curriculum that takes into account the changes in the ways students learn as the student matures in the discipline.

1. The "expertise reversal effect" suggests that worked examples can impede learning with advanced students. The cognitive load techniques in the section above appear to benefit primarily novice learners, encouraging them to learn more quickly and deeper.[204] Indeed, as students advance and develop prior knowledge schemas, worked examples lose effectiveness and can even delay progress of more experienced students.[205] The "expertise reversal effect" notes that techniques effective with novices may lose effectiveness as the learners knowledge increases.[206] Both the expertise reversal effect and the "redundancy effect"[207] suggest that information that helps a novice understand a field can become stiflingly repetitious and thus counterproductive to more advanced

---

204. Spanjers et al., *supra* note 120, at 352.

205. Alexander Renkl & Robert K. Atkinson, *Learning from Worked-Out Examples and Problem Solving*, in Cognitive Load Theory, *supra* note 4, at 91, 93. "[T]he worked-example effect disappears when the learners progress through the phases of cognitive skill acquisition. For instance, if learners have high prior skill levels, then problem solving fosters learning more than studying worked out examples." *Id.* at 93.

206. Slava Kalyuga, *Schema Acquisition and Sources of Cognitive Load* in Cognitive Load Theory, *supra* note 4, at 48, 58.

207. The redundancy effect occurs "when multiple sources of information can be understood separately without the need for mental integration." Sweller et al., *supra* note 19, at 141. It is distinguishable from the "split attention effect," when learners need to integrate "multiple sources of related information presented independently but unintelligible in isolation." *Id.* Thus, the redundancy effect is extraneous cognitive load or unnecessary repetition. *Id.*

students.[208] Cognitive load theorists suggest a "concerted effort" to move a student from studying examples to problem-solving.[209] This notion that law school courses should distinguish between the experiences offered to novices in the first year and third-year students has gained currency in the past ten years. Capstone courses that bring together different doctrines and skills students have learned into a "crowning" experience[210] have become popular at many law schools.[211] Further, the 2007 Carnegie Report, *Educating Lawyers: Preparation for the Practice of Law*,[212] recommended that schools "make better use of the second and third years of law school."[213] Much has also been written recently on the "crisis in legal education" and the need to make law students "practice ready" by offering more experiential learning in the upper-division curriculum.[214] Despite the current emphasis on changing the curriculum as students advance, many upper-division law school classes still follow the same pattern as first-year courses, reading and analyzing cases as examples of lawyering.[215] Cognitive load theory suggests that repetition of the same pattern may not only fail to advance students but may actually obstruct learning.[216]

In the move to give students more practice-like experience, more schools are offering or even requiring experiential learning opportunities like clinics, advanced simulation, and advanced writing classes.[217] The research on moving

208. Sweller et al., *supra* note 19, at 155.

209. Renkl & Atkinson, *supra* note 205, at 93-94.

210. The American Heritage Dictionary of the English Language 201 (William Morris ed., 1981).

211. A quick Google search for "capstone courses law" reveals capstone courses at many schools as various as, for example, Minnesota, Albany, Ohio State, Harvard, Duke, Whittier, Emory, and more.

212. William M. Sullivan et al., Carnegie Foundation for the Advancement of Teaching, http://www.carnegiefoundation.org/sites/default/files/publications/elibrary_pdf_632.pdf (last visited July 20, 2014).

213. *Id.* at 9.

214. *See* Nancy B. Rapoport, *Rethinking U.S. Legal Education: No More "Same Old, Same Old*," 45 Conn. L. Rev. 1409 (2013). Professor Rapoport recommends that law schools create a curriculum that builds more skill sets as law students progress. *Id.* at 1415.

215. Remember the old adage about the three years of law school: "The first year they scare you to death. The second year they work you to death. The third year they bore you to death." *Id.* at 1416.

216. "Processing redundant elements may increase working memory load as indicated by the narrow limits of change principle. It is unlikely to result in additional information transferring to the long-term memory store via the borrowing and reorganizing principle because the information store already contains the relevant information." Sweller et al., *supra* note 19, at 171-72.

217. Ass'n of Legal Writing Dirs. & Legal Writing Inst., Report of the Annual Legal

from worked examples to problem-solving suggests that when advanced courses do not introduce new skills or new forms of analysis, professors should design problem-solving opportunities for students rather than simply providing more examples of familiar forms.

Similarly, when teaching courses that include written products, professors should pay attention to whether the skills required for a new product are sufficiently familiar to move to a problem-solving approach. Thus, for students first encountering writing transactional documents, worked examples might still form an important part of the curriculum. But a student writing more complicated variations on familiar litigation documents needs more opportunities for independent problem-solving.

2. Use the guidance-fading techniques to facilitate the move to problem-solving for advanced students. Although a change to problem-solving in a law school's upper-division classes may be most effective, the change should be gradual. As students gain expertise and move to problem-solving, the "guidance-fading effect" suggests that instructional methods should provide less and less guidance.[218] Fading involves omitting solution steps from worked examples until, finally, only a problem remains to be solved independently and without guidance.[219] Further, the pace of "fading" can correspond to the amount of expertise the students possess. More knowledgeable students perform better in fast-transitioning fading.[220] At intermediate levels of expertise, students will learn best with guided discovery, a mix of external guidance and problem-solving opportunities.[221]

Like the expertise reversal effect, the findings for "guidance fading" support giving more thought to how law students progress through three years of law school. The techniques appropriate for 1L students do not provide the same benefit to 3L students. Each of the three years of law school should be structured to maximize developing growing independence and problem-solving skills.

CONCLUSION

In the current climate of "crisis" in legal education, law schools are re-examining how to structure a curriculum to maximize the opportunities for law students' preparation for the practice of law. Some question the necessity of the third year, while others debate how to make it most beneficial.[222] As

---

WRITING SURVEY 23 (2013), *available at* http://www.lwionline.org/uploads/FileUpload/2013SurveyReportfinal.pdf

218. SWELLER ET AL., *supra* note 19, at 171.

219. Robert K. Atkinson, et al., *Transitioning from Studying Examples to Solving Problems: Effects of Self-Explanation, Prompts, and Fading Worked Out Steps*, 95 J. EDUC. PSYCHOL. 774, 774 (2003).

220. SWELLER ET AL., *supra* note 19, at 175.

221. *Id.* at 182; CLARK ET AL., *supra* note 29, at 250-54.

222. *See e.g.*, BRIAN Z. TAMANAHA, FAILING LAW SCHOOLS 20-21 (2012).

applications decline each student becomes more important to the health of the school, and many schools devote ever more time to supporting the individual law student's journey to a degree.[223] It is more important than ever to ensure that curricular design, course design and class time are efficient and produce better outcomes.

This article has explored the ways in which cognitive load theory and composition theory can inform that process. Many of the techniques developed by cognitive load theorists work best on material with a high level of intrinsic cognitive load.[224] This makes them especially applicable to law school curricular and course design.

Cognitive load theorists suggest that as professors design courses, they consider the prior knowledge of students and whether the student is a novice to the discourse area or more experienced. In the first year, students learn better from worked examples that explicitly segment the knowledge and tasks students must master. Examples should be intentionally chosen for structure, content and variability.

During classes, explicitly teaching students to engage in the internal dialogue of "self-explanation" as they encounter worked examples is critical to enhanced learning. Using "goal-free" questions and "completion problems" can further aid novice students. In writing classes, professors must separate the learning process from the cognitively demanding writing process.

As students progress, good curricular design will do more than simply repeat the pedagogies of the first year. Cognitive load theory supports a gradual process during which students move from the segmented steps of worked examples to more opportunities for problem-solving. Although commentators have focused on experiential learning in the third year of law school, traditional classrooms can also use problem-solving to enhance learning for advanced students. In law schools, courses that may include both second-year and third-year students, guidance fading is an important technique. Schools should also consider more courses such as "capstone" courses, designed specifically for advanced students.

Many good teachers already instinctually employ some of these principles, but intentional and reflective use will make the techniques more effective. Although individual good teachers may intuitively use teaching methodologies that comport with cognitive load research, systematically applying these principles across the law school curriculum can transform the law school experience. As law schools struggle to reform legal education, cognitive load theory speaks to better teaching in all three years of legal education. Perhaps law faculty are now ready to listen.

---

223. A growing number of law schools, for example, offer academic support programs.

224. SWELLER ET AL., *supra* note 19, at 181.