The Past and Likely Future of an Educational Form: A Textbook Case

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At a time when it is seen as increasingly "obsolete," this article analyzes the textbook as an evolving pedagogical form, as a changing medium comprised of smaller media components. These components include images, diagrams and also oral prompts, which have changed not so much through technical innovation as in synchrony with larger cultural and epistemological developments. This article investigates the increasingly sophisticated structuring of this textual and visual content, and the gradually sublimated "oral" interaction simulated through cues and interrogatives. These components have become highly conventionalized and elaborate, characteristics generally ignored to the detriment of publically-funded "open" e-textbook projects. Following Thomas Kuhn's famous analyses of knowledge "paradigms," this article concludes that the textbook's features provide an indispensable animating didactic function.

Keywords: cultural analysis; historical analysis; history; instructional design/development; instructional technologies; media; textbooks; textual analysis

Textbooks are a singularly entrenched and notorious educational form. They have been reviled as "scholastic" (Dewey, 1916, p. 280), "mislead[ing]" (Kuhn, 1963, p. 351), and even tyrannical (Jobrack, 2011). Speaking more impartially, they have also been described as "unusual and difficult . . . in the variety of their parts, the mode of their authoring, and their publication history" (Carr, Carr, & Schultz, 2005, p. 11). The textbook, however, is now said to be undergoing a revolution. Echoing the remarks of other experts (e.g., Smith, 2010), U.S. Secretary of Education Arne Duncan has declared that in our digital age, this form "should be obsolete" (quoted in Lederman, 2012, n.p.).

By saying that the methods of the textbook "are Scholastic—minus the logical accuracy and system of Scholasticism," Dewey (1916, p. 190) contrasted this traditional form unfavorably with the rich potential of experiential learning and inquiry. The idea that textbooks "mislead" comes from the opening of Thomas Kuhn's famous introduction to the "paradigm shift," in *The Structure of Scientific Revolutions* (1962) in which he insisted that textbooks' only purpose is

> persuasive and pedagogic; a concept of science drawn from them is no more likely to fit the enterprise that produced them than an image of a national culture drawn from a tourist brochure or a language text. This essay attempts to show that we have been misled by them in fundamental ways. (p. 1)

In reinforcing stereotypes of knowledge, textbooks stand in the way of new discoveries and paradigms for Kuhn. Their simplified examples, amplified points, and sanitized illustrations are not conducive to the "problem solving" or "puzzle solving" that for Kuhn—and also for constructivists today—constitute authentic epistemic or scientific work.

Like this article however, Kuhn, did not view the textbook as a fixed and monolithic form. At the risk of using the term anachronistically at points, the "textbook" is analyzed here largely from the perspective of postsecondary education, specifically as an evolving educational form that combines a number of subgenres, many of which are many hundreds of years old. These include myriad textual and typographical conventions, images and diagrams, and even elements of oral communication.[3] Combinations of components have changed and evolved, not so much in direct response to new media technologies but in relation to each other and in synchrony with markers of broader cultural, pedagogical, and epistemological change. As in an earlier examination of "the lecture as a transmedial pedagogical form" (Friesen, 2011), this article shows how the continuing adaptability of a popular but often ignored pedagogical genre is almost certain to sustain it in the future. At a time when the textbook is ubiquitous yet thought to be disappearing, this

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Educational Researcher, Vol. XX No. X, pp. 1–11
DOI: 10.3102/0013189X13513535

article looks to a richly documented past to envision possibilities for its future.

Predictions for the future of the textbook are often articulated in terms that respond, broadly speaking, to the critiques of the textbook articulated by Dewey and Kuhn above. Reporting on a release of the Apple iBooks App (designed specifically for textbook authoring), one article predicted that this "commercial" model of the textbook will not be a "book" at all but rather a kind of "software" that offers a high-tech version of Dewey's experiential inquiry: "interactive learning experiences," in which user engagement is anticipated and enhanced through "analytics and feedback and rich technology" (Ogg, 2012, n.p.). Others have envisioned an explicitly open or noncommercial model, looking to Wikis (like Wikipedia) and to "creative commons" licensing (Lessig, 2004) that allow digital educational "content [to] be created, shared, and distributed by those directly engaged in the teaching and learning process itself" (Petrides, 2012, n.p.). Ultimately, this is seen as enabling teachers and learners to participate in activities similar to those identified by Kuhn as proper to the scientist. Pushed to an extreme, this approach is also seen as ultimately rendering the textbook itself obsolete:

> [T]hanks to openly licensed content . . . we needn't write textbooks from scratch. . . . [L]earners—not just teachers or publishers—[can] build their own "textbooks" (although at this point, I wonder if we can just ditch that whole term), to construct and reflect on their own knowledge production (not reproduction). (Watters, 2012, n.p.)

Open textbooks, in other words, are envisioned as allowing the learner and teacher to discover and construct knowledge by finding, evaluating, and (re)mixing "content," rather than simply receiving and reproducing it in a fixed, prepackaged form.

Of course, there are many positions and possibilities between these established commercial and broadly noncommercial open "extremes." All are vying for success in economies of scale that are enormous: Revenue from textbooks is greater than that from the entire popular book market combined (Carmody, 2012), and textbooks have been undergoing price increases that are dwarfed only by those in healthcare, tobacco products, and in tuition itself (Novack, 2012). Visions of the future obsolescence of the textbook, however, raise significant questions about the conventional pedagogical functions of this educational form: What is it that textbooks provide pedagogically and epistemologically, besides a reminder of the weight of the past? How might they change in the future, and how could such changes serve the interests of publishers, authors, students, and educators?

The Textbook *Avant la Lettre*

As a "medium" developed especially for study, the textbook has "flourished since the early modern period" through the impact of printing and the expansion of education (Blair, 2004, p. 87). There are, however, medieval and ancient texts and manuscripts that anticipate the characteristics of today's "textbook"—and a couple of examples offer a good starting point for working toward an understanding of this unusual and difficult genre.

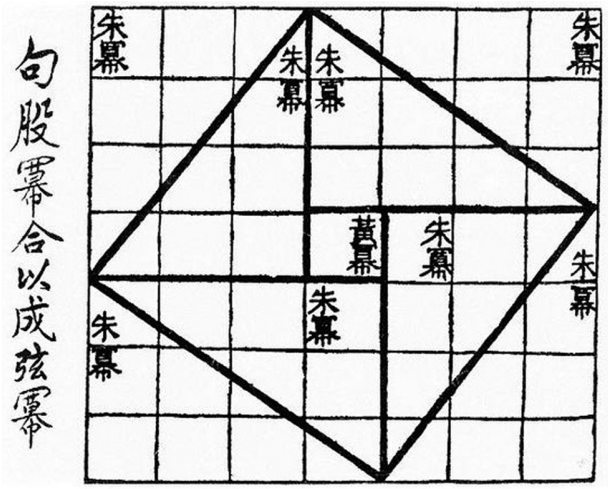
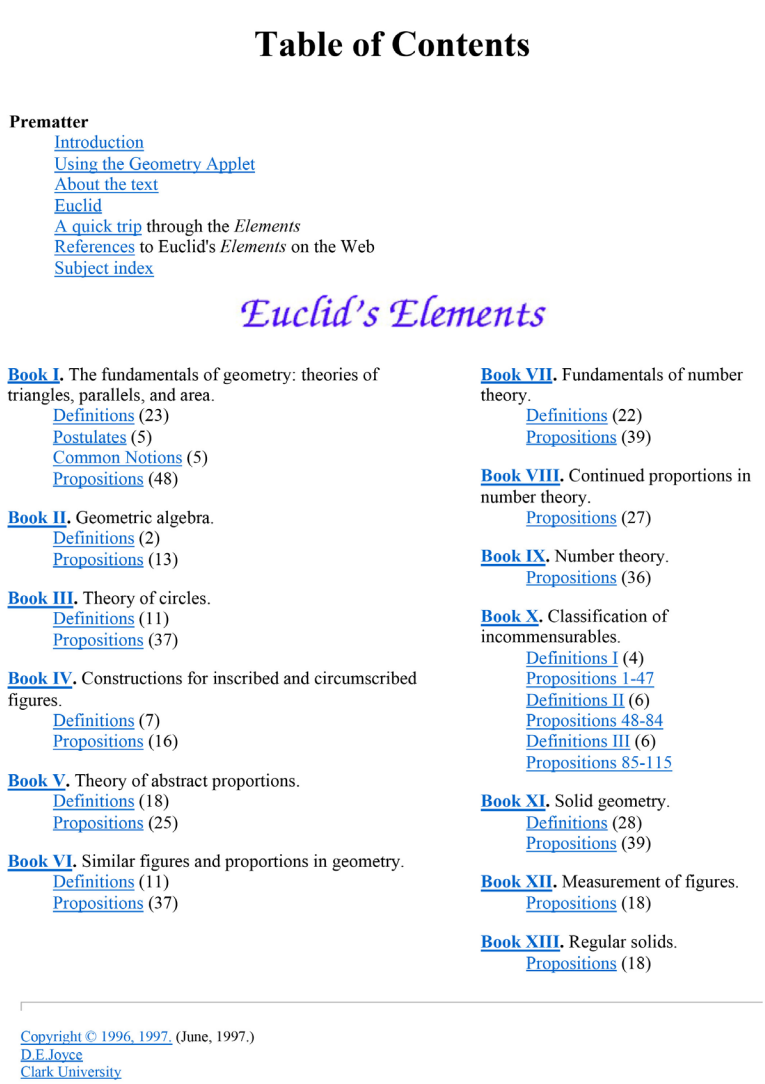


FIGURE 1. *The Pythagorean Theorem in the* Zhou Bi Suan Jing*. The area of the four bold triangles is equal to the area of the large, oblique square minus the small square in the center (credit: Wikimedia Commons).*

Two of the earliest examples appear in the centuries before the Common Era. The first is the anonymous *Zhou Bi Suan Jing* or *Arithmetical Classic of the Gnomon*[4] *and the Circular Paths of Heaven*, a compendium appearing sometime during the Zhou Dynasty (1046–256 BCE). It contains 246 practical problems, solutions, and associated proofs or algorithms. It is structured by a dialogue consisting of questions posed by the Duke of Zhu and the answers of a particularly knowledgeable minister. Only recently translated into English (Cullen, 2007), this book provides an illustration of the Pythagorean Theorem ($a^2 + b^2 = h^2$, as shown in Figure 1), using less than half of the mathematical steps of standard Western proofs and illustrations. This particular example of economy in visual and logical expression, noted by Tufte (2005, p. 82) and others, later proves to be an important characteristic of the textbook genre.

A second example is Euclid's *Elements*, also a compendium, which provides the oldest "axiomatic-deductive" treatment of mathematics. It begins with the most basic first principles and logically elaborates the basis for "Euclidian" geometry and other subjects. It offers a total of 131 definitions (e.g., "A line is breadthless length") and 468 propositions based on them (e.g., "In any triangle, the sum of any two angles is less than two right angles"), using these to derive still further mathematical proofs. Its tightly imbricated logical exposition served as a foundation for the works of Isaac Newton and Galileo, and it inspired similar treatments of logical "elements," from those of Baruch Spinoza to Ludwig Wittgenstein's *Tractatus Logico-Philosophicus*:

> The *Elements* of Euclid was an introductory textbook covering all *elementary mathematics* . . . the most successful mathematics textbook ever written.... [I]t has been estimated that . . . at least a thousand editions have been published. Perhaps no book other than the Bible can boast so many editions, and certainly no mathematical work has had an influence comparable [to it]. (Merzbach & Boyer, 2011, pp. 90, 92, 109; emphasis in original)



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D.E.Joyce
Clark University

FIGURE 2. *Online table of contents for Euclid's* Elements *(Joyce, 1996; used with permission).*

The *Zhou Bi Suan Jing* and the *Elements* present rudiments of many of the principle characteristics of today's textbooks. First, textbooks are, as Carr et al. (2005) have observed, "unusual and difficult . . . in the mode of their authoring" (p. 11). These two ancient collections do not originate from a single mind or hand; their organization (from their largest parts to their smallest definitions) reflects an expository logic that is neither personal nor authorial, but instead responsive to the subject matter.[5]

Second, this rigorous organization follows a number of common patterns. As Chambliss and Calfee observed in their comprehensive *Textbooks for Learning* (1998), "[T]extbooks come in layers, something like an onion. The entire book, the outer husk, as signaled in the table of contents . . . [is an aspect that] seldom receives the attention it deserves" (p. 17). This characterization is powerfully illustrated in a table of contents for Euclid's *Elements* (Figure 2). This apparently straightforward listing articulates concentric and other forms of organization found in textbooks—sequential, hierarchical, associative, and tabular (Chambliss & Calfee, 1998; Reigeluth, Merrill, Wilson, & Spiller, 1980)—in multiple ways: As a whole, the 13 books of the *Elements* progress sequentially from simple to complex, from the "fundamentals of geometry" all the way to "number theory" and "incommensurables." Each chapter, in turn, is structured hierarchically, subsuming definitions and propositions under a unifying theme. These definitions and propositions themselves progress inductively, from definitional observation to propositional abstraction.

Although the *Zhou Bi Suan Jing* does not offer quite the same multilayered, iterative organization as the *Elements*, it includes a third major feature of the textbook: oral mediation in the form of *dialogical* exposition, in this case between a duke and his advisor, which serves to contextualize and also dramatize its content. Indeed, the history of instructional texts throughout the Common Era can be summarized as a process of formalizing and highlighting structural patterns of organization, and sublimating this dialogical modality: Structural organization of all kinds has become increasingly conspicuous, whereas dialogue only *seems* to disappear. As this article argues, however, the latter is actually integrated even more deeply into the heart of the textbook genre.


Catechiſmus.

LECTIO I.

Der 1. Sontag.

Frag.

Was iſt dein einiger troſt in leben vnd in ſterben?

Antwort.

Daß ich mit Leib vnd Seel/ beyde in leben vnnd in ſterben [a] nicht mein [b] / ſonder meines getrewen Heilands Jeſu Chriſti eigen bin [c] / der mit ſeinem thewren blut [d] für alle meine ſünden volkomlich bezalt [e] / vñ mich auß allê gwalt des Teuffels erlöſet hat [f] / vñ alſo bewaret [g] / daß one den willen meines Vatters im himmel/

a Rom. 14
b 1. Cor. 6.
c 1. Cor. 3.
d 1. Pet. 1.
e 1. Joh. 1. & 2.
f 1. Joh. 3.
g Johan 6.

Catechism

1st reading; the 1st Sunday

Question

What is your only comfort in life and death?

Answer

That I am not my own,[a] but belong with body and soul/ both in life and in death[b] / to my faithful Saviour Jesus Christ[c] / He has fully paid for all my sins with His precious blood,[d] and has set me free[e] / from all the power of the devil[f] / He also preserves me[g] in such a way / that without the will of my heavenly Father…

a Rom. 14.
b I. Cor. 6.
c I. Cor. 3.
d I. Pet. 1.
e I. Joh. 1. & 2.
f I. Joh. 3.
g Joh. 6.

FIGURE 3. *First page of the original* Heidelberg Catechism *from the 1560s and in translation (translation from Centre for Reformed Theology and Apologetics, 2012).*

The Catechism: Teacher-Proofed "Propaganda"

As far as the "modern" textbook is concerned, the most important inaugural event is not necessarily the appearance of the printing press but the Protestant Reformation. It is telling that among Johannes Gutenberg's earliest printing tasks were indulgences (papal certification that one had literally "paid" for one's sins), and broadsides protesting these and other aspects of Roman control (Füssel, 2005, pp. 26, 149). Together, the emergence of Lutheran and other Protestant denominations and the "Counter-Reformational" responses of the Catholic Church amounted to an unprecedented social and spiritual battle for hearts and minds. It was this battle of doctrine and dogma that historians believe formed the crucible for some of the most basic and widespread forms of schooling and pedagogy (e.g., Hamilton, 1989; Tröhler, 2009). For example, in declaring that individual faith alone is important, Martin Luther and other reformers, like John Calvin, argued that direct access to the truth of God's word—and thus also to schooling and literacy—is a universal prerequisite. Knowledge of religious truths in Latin manuscripts could no longer be the privilege of the *few*; instead, access to these in one's mother tongue became a necessity for *all*:

> If the medieval church had adopted schooling merely to discipline its cadre of teachers and preachers, Calvinists . . . and . . . Lutherans . . . began to use schooling for a broader political purpose—the disciplining of the population at large. Schooling, that is, underwent its own reformation. It took on an additional social mission—the ideological incorporation of the subordinate members of society. (Hamilton 1989, p. 16)

In the medieval era, before mass (re)production of texts through printing was possible, books were rare and expensive; the reliable reproduction of any content by hand, particularly of typographical and diagrammatic detail, was an enormous challenge (Eisenstein, 2012). Books, in short, could not serve as media of mass instruction. In addition, although this changed with the printing press, it was not enough to simply "repurpose" preexisting content for religious education. Luther translating the Bible into German or King James having it rendered in English was pedagogically insufficient. Instead, preexisting educational genres needed to be remixed and adapted, resulting in a new form that can be said to have been "born typographic"—in much the same way that documents and other resources are now "born digital." One important preexisting educational genre was the Catholic catechism, which was undertaken through group instruction and through question and recited answer. This form was reimagined for Protestantism, the printing press, and more individualized study. For example, speaking of his "Smaller Catechism" (1986), which came to be known as the "laymen's bible," "Martin Luther insisted that "young and simple people must be taught by uniform, settled texts and forms, otherwise they easily become confused" (n.p.). And "those who are unwilling to learn" his own catechism, Luther added, ". . .should simply be turned back to the Pope and his officials, yea, to the devil himself" (n.p.).

The facsimile and translation in Figure 3 are from the *Heidelberg Catechism*, a Protestant text that appeared about 50 years after Luther's version. It displays a number of characteristics that are important for the textbook. These have to do first of all with its logical and dialogical structure. The identification of the "first reading" and "first Sunday," at the top left, is a way of foregrounding the sequential structure of the book and also of scripting its use. This catechism is divided into 52 parts, with each corresponding to a Sunday over the course of a year, reinforcing a regularity of pedagogical practice and giving it a logic that also corresponds to Christian sacraments and celebrations. It opens with the question of the reader's or catechist's life and death, and it concludes with the question of the meaning of the ceremonial "amen." In between, it catechizes on the life of Christ over the Easter season and uses much of the remaining time to cover the 10 Commandments and the Lord's Prayer. Its lettered references to various passages in the New Testament instantiate

what Chambliss and Calfee (1998) have identified as a "network structure," drawing connections within the catechism page itself and creating linkages to outside biblical sources. Of course, this catechism and others like it do not follow a strictly axiomatic organization as exemplified in Euclid's *Elements*. Instead, they work to inculcate in their readers a series of dogma and thus, in principle, offer a method suitable to a variety of subjects.

The *Heidelberg Catechism* also displays a wide range of detailed typographical variation and cueing—part of a type of visual organization that is key to today's textbooks. It includes multiple fonts (in Gothic and Latin styles), font sizes, superscript characters, and dropped capitals. Although these elements were not unknown in texts before the printing press, they could not be easily and accurately reproduced—much less produced *en masse*. Innovations by Protestant educators Petrus Ramus and J. A. Comenius further illustrate the importance of precise, reproducible visual arrangements in instructional texts. Using horizontal branching structures, Ramus devised a diagrammatic "method" in the sixteenth century that he said could be used for any subject matter. An innovation that is echoed in today's hierarchical charts and "mind maps," this system of "ramifications" was also the first "content-independent" instructional technique to be identified as such (Hamilton, 2003). In 1658, Comenius published his *Orbis Pictus*, an intricately illustrated multilingual reader for children: One side contained numbered illustrations from everyday life, and the opposite offered a kind of "legend," with explanations in both Latin and a local tongue.

From Catechism to the "Inductive Method"

As it came to be used in education, catechism—typically in the form of answers provided by memory from students in response to a teacher's recited questions—provided a kind of "script" for oral educational performance, one that is potentially suited to any subject or dogma, however arbitrary its contents. This question-and-answer format was also well suited to the kind of literacy training that was driven by the Protestant Reformation and Catholic Counter-Reformation. This training focused on reading to the *exclusion* of writing. Students were not seen as the *authors* of their own words or thoughts, but instead they were trained as the *recipients* of the words of God and other authorities; and those few who *were* taught to write at this time were seen as copyists, recording the words of others (Bosse, 2012).

As a script, the catechism provides not just an expository method but also a pedagogical or teacherly method, one that is virtually "teacher-proof." As J. F. Wakefield explained,

> If the goal were memorization, the catechetical style eliminated the need for either pedagogical knowledge or subject knowledge on the part of the teacher. The voice of the teacher and the textbook author were not only in agreement, they were the same! (1998, p. 5)

Because it amounts to little more than a form of oral performance, the execution of this pedagogy calls for an absolute minimum of equipment. Besides the text of the catechism in the teacher's hand, students could be taught without books, paper, or any other equipment. Consequently, as Wakefield continues

> [T]the catechetical style [was in] evidenc[e in] . . . grammars well into the nineteenth century. Noah Webster (1758–1843) was perhaps America's most successful [textbook] author of the last half of the eighteenth century. Part II of Webster's (1783) *Grammatical institute of the English language* couched all of its definitions in question and answer format:
>
> "What is Grammar?
>
> Grammar is the art of communicating thoughts by words with propriety and dispatch.
>
> What is the use of English Grammar?
>
> To teach the true principles and idioms of the English language." (pp. 2–3)

However, just as this type of catechism was becoming established in the United States, it was being subjected to criticism in Europe, even among educators of an explicitly religious bent. Johann Gottfried Herder, a pastor, linguist, and philosopher, scolded catechetical teachers in one of his "School Addresses" from 1800:

> But remember, you catechists: The eternal to and fro from subject to predicate, from predicate to subject: "Who created you? Who (else) did he create?" is not really catechizing, but actually a kind of bodily "yawning" of the word . . . little more than the "giddyap" of the coachman. . . . One must [instead] catechize in one's own words; one must draw one's own words out from that which is catechized. *One's own words*: these and these alone signify one's own thoughts. (Herder, 1953, p. 732; author's translation; emphasis in original)

These arguments mark a larger change in educational and epistemological cultures. True knowledge or belief, Herder was saying, is neither in the catechetic text nor embodied in the catechizing voice or body; it is instead what one expresses "in one's own words," to directly "signify one's own thoughts." The voice of the teacher, the textbook author, and the student should no longer simply be "in agreement" or "the same," *pace* Wakefield. It is no longer sufficient that everyone simply "know[s]. . . uniform, settled texts and forms," as Luther had expected. Herder's argumentation can be seen as making a major epistemological shift for the textbook and for pedagogical knowledge more generally: The *individual*, whether student or teacher, rather than the *text*, is defined as both the source and guarantor of knowledge. Literacy, correspondingly, is no longer a matter of reading and (at most) copying. Instead, it is now framed as a way of allowing students to become the authors of their own words and thoughts: "Pupils must learn to write for themselves," as one reformer asserted in 1796, ". . . not so that they may one day write their signature, but so that they may follow the order of their thoughts in their own writing, and thus share these with others" (Carl Gottlieb Horstig, as quoted in Bosse, 2012, p. 99).

Instead of simply being rendered obsolete by these changes, however, the textbook, particularly its orally-based catechetical form, was rapidly repositioned to contribute to the emerging epistemological and didactic order. How could a standardized *book* embody an affirmation of the *individual's* thoughts and words? How could the printed word encourage readers to signify

their own thoughts in their own voice? During the course of the nineteenth century, this paradoxical accomplishment was achieved by the catechetical form being opened up and turned in on itself. Textbook readers were positioned not as a collectivity engaged in an obligatory exercise of recitation but as receptive listeners to *their own* responses and thoughts. And these responses were not *scripted*, but rather were *prompted* by the textbook', and its appeal to issues of immediate concern to students.

To trace this development, it is useful to go back to the beginning of the century in which this change has its roots—to the 3rd Earl of Shaftesbury, a prominent politician, philosopher, and writer. In his 1710 "Soliloquy, or Advice to an Author," Shaftesbury imagined,

> One wou'd think, there was nothing easier with us, than to know our own Minds. . . . But our Thoughts have generally such an obscure implicit language, that 'tis the hardest thing in the world to make 'em speak out distinctly. For this reason, the right method is to give them voice and accent . . . [and] by virtue of an intimate recess . . . and divide our-selves into *two partys* [to offer a] . . . good correspondence with *our-selves*. (1711, pp. 169, 171, 292)

Through a doubling of the self or soul, Shaftesbury is saying, the reader can be both student and teacher, or, in Shaftesbury's own words, we can become "properly our own Subjects of Practice" (p. 169). The individual can then enter "once thorowly *into Himself*, and proceed by *Interrogatorys* to form the *Home-Acquaintance* and Familiarity requir'd" (Shaftesbury, p. 172). The student is expected to learn by being both the questioner and the answerer of questions. The catechetical "yawning" of the word, so despised by Herder, acquires the potential to become a kind of internal conversation. It could be a self-addressed dialogue, prompted and guided by the textbook but carried on "within" the student him or herself.

Johann Heinrich Pestalozzi, an avid reader of Shaftesbury (Horlacher, 2004), later described more precisely how this kind of "correspondence with *our-selves*" might be prompted and guided in textual form. This was not through the statement of abstract facts—like the reflexive questions and answers so despised by Herder, "Who created you? Who (else) did he create?"—but instead by directing readers to concrete realities that were literally right in front of them. Perkinson (1985) explained that "the first Pestalozzian textbook appeared [in the United States] in 1821, *First Lessons in Arithmetic*, compiled by Warren Colburn":

> This book had a tremendous influence on all subsequent arithmetic textbooks. Its main contribution was to construe mathematics as a process of observation rather than as a "ciphering" procedure. (How many thumbs do you have on your right hand? How many on your left? How many on both together?) (p. xii)

In strictly logical terms, this type of questioning, focusing on the self (specifically, on the hands) and on concrete details (the number of thumbs on each), is an "inductive" logical progression moving from concrete particulars to abstract principles. Perkinson went on to describe the textbooks that soon followed:

> Roswell Chamberlain Smith, for example, in his *Intellectual and Practical Grammar in a Series of Inductive Questions* (1830) eschewed memorization of the rules of grammar, and instead used questions to develop an understanding of rules and definitions. Geography texts, too, used the "inductive method." Jessie Olney in his *Modern Geography* (1830) wrote that it was essential for the learner to thoroughly absorb the simple facts before more complex lessons could be understood. In all subject matter, the old catechetical questions common to earlier textbooks gave way after the 1840's to inductive questions. (p. xii)

By using concrete examples, for instance of grammar rules or of basic geographical formations, to lead to abstract generalities, this "inductive approach" guides the student away from prescribed answers, asking him or her "to determine an explanation for him [or her]self" (Perkinson, p. xii).

From the Inductive Method to the "Self-Explanation Effect"

Despite the continued importance of the textbook in education, studies of its evolution in the twentieth century are relatively rare. There has been no lack of research, however, into the instructional value of careful visual design and of textually induced "internal dialogues" in the reader. In the book *Internal Rhetorics: Toward a History and Theory of Self-Persuasion* (2001), Jean Nienkamp provided a genealogy of this type of dialogue from its explicit formulation in Shaftesbury, through its renewal and revision in George Herbert Mead and Lev Vygotsky, to its present-day incarnations in pop psychology. Vygotsky, Nienkamp reminded us, saw the internalization of speech and associated social relations as being nothing less than *constitutive* of human cognitive development: "All the higher functions," as Vygotsky (1978) put it, "originate as actual relations between human individuals" (p. 57). The notion of cognition as the *intra*personal interchange of linguistic data is also certainly germane to cognitive science, which sees forms of self-talk as a kind of "information processing" that is intrinsic to learning.

This cognitivist approach to intrapersonal communication perhaps began with Herbert Simon's notion of "talk aloud" or "think aloud" protocols, in which "subjects' verbal . . . reports of their own mental states and mental processes" are seen as highly valuable "psychological datum" (Ericsson & Simon, 1984, pp. 7, 9). In this context, the self is regarded as reflexively communicating its thoughts directly with itself as a part of routine information-processing tasks. This soon led to the idea of using this same articulated thinking or data to reflexively *control* or *impact* one's own internal states—particularly while undertaking study and schoolwork. In a 1993 article, Alfred Bandura underscored the importance of investigating a wide variety of "self-phenomena" or "self-processes" to optimize cognitive function in academic contexts. The result has been the development of an entire subspecialization in the "self-regulation" of cognitive states and processes in student work. In this study of "self-regulated learning," activities like "textual elaboration" and "self-explanation"–specifically in engagement with textbook materials–are among the most researched phenomena. The first of these, textual elaboration, refers to the generation of

explications for oneself as a way of processing information while reading difficult passages. "In the process of elaboration," as Rahimi and Rezaei (2011) put it, "explicative expressions are added [by the student] to the text to compensate for unknown, complex linguistic items that induce reading comprehension problems" (p. 12).

Self-explanation has been defined specifically in relationship to students' engagement with the inductive problems that have long been staple textbook content. "Self-explanation refers to a reflective activity explaining to oneself a learning material in order to understand facts from . . . [this material] or to repair misunderstanding . . . [of] worked-out examples" (Kwon, Kumalasari, & Howland, 2011, p. 96). The self-explanation *effect*, as VanLehn, Jones, and Chi (1991) explained, is based on studies using talk-aloud protocols, which show that "[g]ood students [*sic*] . . . explain examples to themselves[,] learn better [and] make more accurate self-assessments of their understanding . . . while solving problems" (p. 1). Despite the notably different tone and vocabulary from those associated with Shaftesbury (1711), concepts like "self-regulation," "elaboration," and "self-explanation" have in effect given new life to his injunction to engage in a "good correspondence with *our-selves*" (p. 292).

The Paper Chase, or Catching Up With Dead-Tree Editions

Having used historical examples to show how textbook characteristics have evolved and stabilized throughout the centuries, this article now briefly turns to two examples illustrating new forms and models for the textbook's future—and quite different types of efficacy in relation to its past.

Both pages in Figures 4 and 5 are from e-textbooks in introductory psychology; both are examples of the virtual textbook invoked by Arne Duncan and others (although these two examples do not extend to the "experiential software" envisioned by some). One (left) is a commercial production from a press that is owned by Macmillan, and provided for the Apple iPad as a part of Macmillan's "CourseSmart" app. The other reflects the "open" model for the e-textbook, and it is composed and published with the same open, collaborative authoring tool used for Wikipedia. It is certainly the case that the use of this technical platform for a textbook is quite inventive, allowing learners—in addition to teachers and other experts—to quite literally build "textbooks" of their own.

It is perhaps telling at the same time that Macmillan's e-textbook reflects many characteristics from textbooks of the past. The one page shown in Figure 4 integrates no fewer than 12 different typefaces, all of which highlight structures that are key to the textbook as a form, going back as far as Euclid's *Elements*. A hierarchical or branching tree organization is illustrated at the page's upper left, a matrix organization is indicated by the photographs and text near the bottom ("Throughout this book, you will see examples not only of our cultural and gender diversity but also of the similarities that define our shared human nature"; Myers, 2009), and each chapter provides photos and questions that correspond to its various parts. The inductive questioning developed through Shaftesbury's and Pestalozzi's methods are also clearly in evidence. The page asks, for example, "Have you ever found yourself reacting to something as one of your biological parents would . . . and then wondering how much of your personality you inherited?" Through this question, this opening page poses a central problem of psychology, that of culture versus nature. It frames this question, moreover, through a concrete example likely of direct relevance to a young student reader (concerning the differences between one's self and one's parents). Again reminiscent of the *Heidelberg Catechism*, this text begins by using straightforward language that places the reader in a kind of "cosmic" order that is consistent with the text's overall intent. Of course, it does not ask about one's only "comfort in life and death," but instead it positions the reader in a complex and sometimes mysterious material cosmology, with the implicit promise (as underscored by the Spinoza quotation at center left) that a dispassionate and material psychological science can shed light on these mysteries and complexities.

Particularly conspicuous in the open-textbook example, in contrast, is the *absence* of many of these conventionalized characteristics. As the overwhelming typographic uniformity of the single Web page of text suggests, it does not offer any instances of inductive questioning or of addressing and placing the reader in an implied order or disciplinary realm, and it offers little or no hierarchical or tabular organization. A system of references, however, *is* provided in the form of links embedded in the text that point outward in a type of "network structure." The graphical and hierarchical features prominent at the top and top right, meanwhile, refer only to the Wiki platform and the Wikibooks website as a whole, providing no indication of the overall order of the psychology textbook itself. Besides the redundant titling, highlighted links, and bolded definition, all near the top, there are no unambiguous indicators of structure or organization, nor are there cues regarding the relative importance of any one part of the page in relation to any other.

This comparison of a commercial textbook and an open-access textbook is not meant as an apology for Macmillan or for other commercial textbook publishers. It indicates, however, how commercial production models *seem* to provide for a type of didactic and design value that open textbooks, however flexible and economical, are apparently missing. In the present-day cycle of knowledge (re)production, the carefully written, designed, and "didacticized" content exemplified in the commercial text can be said to perform an indispensable animating or quickening function—one, I conclude, that is too often ignored.

Coda: Shift Happens?

Using multiple and carefully coordinated typographic, diagrammatic, and oral characteristics, the textbook (to adapt Shaftesbury's words) induces its readers to "and divide our-selves into *two partys*" and to become "properly our own Subjects of Practice" (1711, pp. 169, 171). In the fragment from the Macmillan psychology textbook provided in Figure 4, the reader is addressed directly (as "you") three times and is asked no fewer than seven different questions. From the immediacy and universality of the human smile through to prompts about one's own family and culture, the form and content of this page can be said to work together to create a multisensory, interactive "illusion". It does

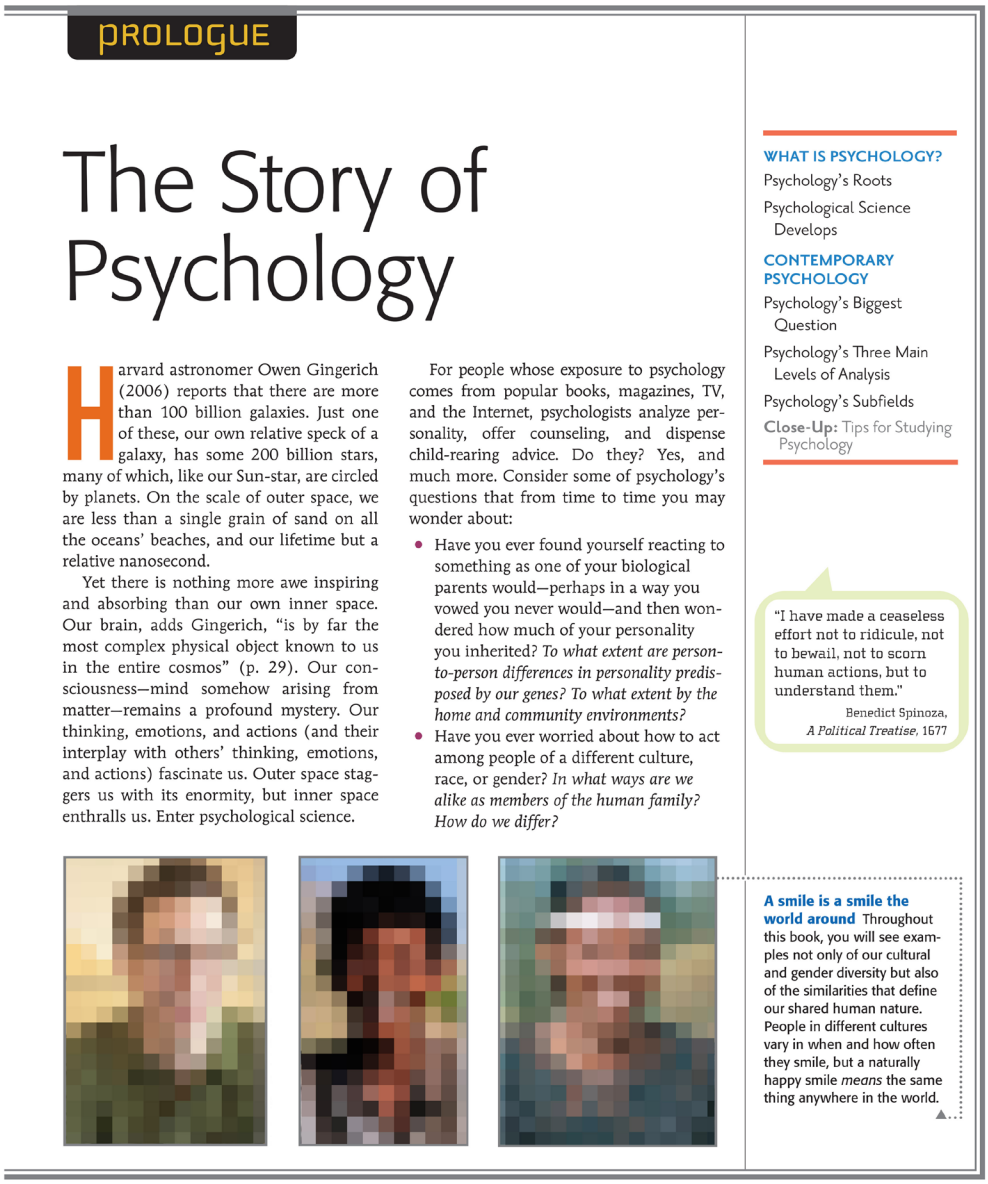

FIGURE 4. Psychology *(Myers, 2009), an e-textbook from Worth Publishers, an imprint of Macmillan, used with permission.*

this, moreover, specifically in its presentation of some of the oldest and most established themes in the discipline of psychology. By presenting its quite conventional material *conversationally*, as immediate, and even as pressing, the textbook strives to achieve a kind of transformation: This is the metamorphosis of a textual *artifact* into a kind of simulated oral *event*, a vivification of inert print material into a lively activity, a thinking-aloud, a self-explanation, or, more broadly, a catechism with oneself.

Recalling Thomas Kuhn, it is important to emphasize that he actually valued the textbook as providing a clear counterpoint to any new, paradigmatic shift or revision in knowledge:

> [T]hese books exhibit, from the very start, concrete problem-solutions that the profession has come to accept as paradigms, and they then ask the student, either with a pencil and paper or in the laboratory, to solve for himself problems closely modeled in method and substance upon those through which the text has led him. (Kuhn, 1963, p. 351)

To thus recognize and be guided by cues and patterns in the material, and to be asked questions to solve for oneself—all while actually looking at only the layout of a page or images on a screen—is to have been taken in by an accomplished illusion. This illusion, moreover, is generally used to inculcate nothing less than standard dogma. And the original reconstruction and validation of this knowledge are not nearly as important as straightforward mastery—at least according to Kuhn:

> Though scientific development is particularly productive of consequential novelties, scientific education remains a relatively

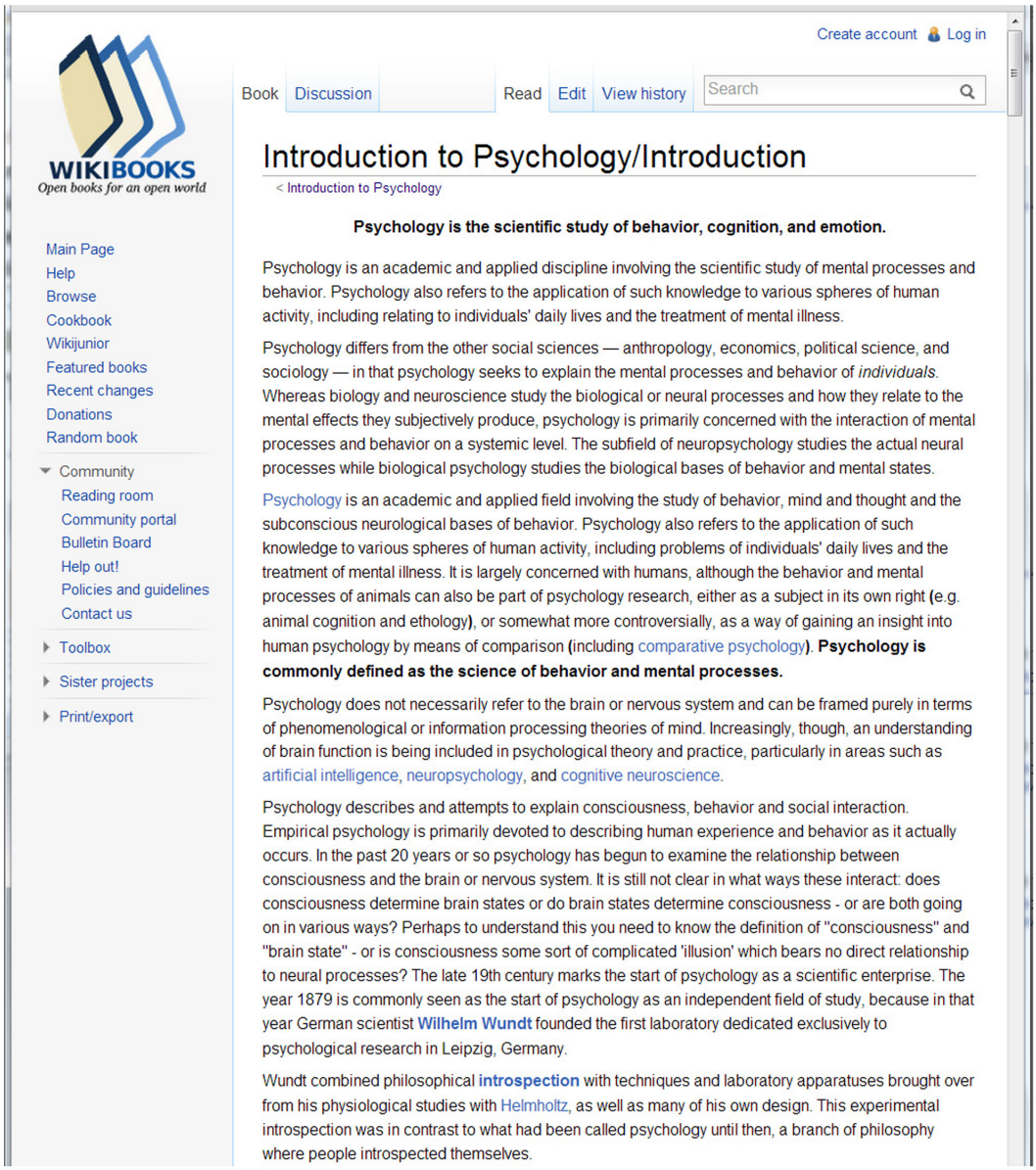

FIGURE 5. Introduction to Psychology *from* Wikibooks *(2012).*

> dogmatic initiation into a pre-established problem solving tradition that the student is neither invited nor equipped to evaluate. (1963, p. 351)

This type of structuring, simulation, and stimulation are hardly properties of scientific or disciplinary knowledge itself. The characteristics of the textbook are instead characteristics of knowledge that have been made *didactic* or *pedagogical* (Tröhler, 2008), and that lead it to demand its own unique and intensive didactic or pedagogical interactions from student learners. This educational content, in other words, represents a stage in the production and reproduction of knowledge that, as Kuhn makes clear, is more about an *illusion* of engagement in paradigmatic originality than about any authentic construction or reconstruction of these novelties themselves.

NOTES

[1]This article has greatly benefitted from the encouragement and advice of many experts: Rebekka Horlacher (Zürich), Karsten Kenklies (Jena), Rainer Leschke (Siegen), Bill Pinar (Vancouver), and Daniel Tröhler (Luxembourg).

[2]See overviews by Nagel, Woodward, and Elliott (1988) and Johnsen (1993).

[3]For more on the oral characteristics of in the textbook, see Ong (1980). Note also that the method used in this article is distinct from social-semiotic "multimodal" analyses of sign systems. Instead of focusing on synchronic modalities, the present analysis attends to the diachronic dimension, and to contexts of culture and practice not necessarily evident in semiotic resources and their functional affordances.

[4]The part of a sundial that casts a shadow.

[5]Sometimes, when a single author's or publisher's reputation itself communicates this recognition and responsiveness, it appears not under

the book's title but *within* it, for example in *Gray's Anatomy* or *Norton Anthologies*.

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Manuscript received December 18, 2012
Revisions received June 14, 2013,
and September 14, 2013
Accepted September 20, 2013