

Deconstructing a Popular Science Book: Fresh Take on the Book Report

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ABSTRACT

Freshman students are instructed to read a popular science book related to the topic of the course and produce an outline of the work. To achieve this, they must identify the author's thesis and the arguments brought forth in support of the thesis. This analysis is done for the whole book and is repeated for every chapter. This exercise develops the ability to grasp how experiments serve as evidence in scientific discourse. This gives students the tools to read popular science books critically. Given the ease of access to this type of resource, this assignment may develop lifelong skills for scientifically informed citizens.

Keywords: Popular science book; trade book; book report; essay outline; critical thinking; scientific arguments; scientific discourse; thesis; experiments.

○ Introduction

Popular science books, sometimes called “trade books,” are written for a general audience and can enhance the science curriculum (Jensen & Moore, 2008; Benedict, 2013). The narrative of such books typically introduces key personalities involved in scientific discoveries, communicates knowledge gained from landmark experiments, and discusses their implications. While such a broad, context-rich exploration of a topic could benefit any student (Lumpe & Beck, 1996), this approach is particularly important for nonmajors who may not have an inherent curiosity for the field and who struggle to see the relevance to their own interests (Nastase & Scharmann, 1991; Wells & Neff, 2001). Another advantage of introducing popular science books in the classroom is that they are a resource easily accessible to students once they graduate (Liu, 2009; Glausiusz, 2013). Familiarizing students with this resource and giving them the tools to analyze it critically encourages the development of skills needed to be scientifically informed citizens.

Dissecting the book in this manner forces students to consider how scientific evidence is used as arguments in support of a thesis.

I have incorporated popular science books in my nonmajors biology classes for almost a decade. In the past, students produced a book report by writing a brief synopsis of each chapter. While most students produced coherent summaries, I was surprised by some of the comments made during discussions. For example, students would express dismay about how the author went on a tangent, when I knew that the experiment they were referring to was pivotal to the central argument. In other words, my students understood individual experiments described in the book but failed to grasp the structure of the arguments presented by the author and how each piece of scientific evidence fits together to convince the reader of a “take-home message.”

Armed with this insight, I revised the assignment. Students now have to deconstruct a popular science book. They are asked to identify the author's thesis and analyze the arguments advanced in support of that thesis. Students do this analysis for the whole book and also for each chapter. In effect, students create the outline that the author may have had in mind when writing the book. Dissecting the book in this manner forces students to consider how scientific evidence is used as arguments in support of a thesis and is an excellent exercise in critical thinking.

This assignment was developed for an undergraduate audience, but it could be implemented in the high school classroom. Table 1 outlines the specific Common Core State Standards (2014) that are developed in the course of this activity.

○ How to Do It

At the beginning of a course, several popular science books on topics related to the course are proposed to students. (I have always recommended books that I know to be scientifically sound. As a modification to this assignment, a colleague recommends using books in which the science is more controversial as a way to exercise students' critical-thinking abilities and closely examine the evidence advanced in

Table 1. The assignment described in this article helps students develop skills that align with Common Core State Standards (2014), particularly those aimed at English language arts and literacy (ELA) in historical/social studies, science, and technical subjects. The specific standards practiced in the course of this activity are identified here.

Common Core State Standard	Description
CCSS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCSS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCSS.ELA-Literacy.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
CCSS.ELA-Literacy.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

support of each claim. This would be an interesting challenge for science majors and/or senior students.) In a class of 20 students, six books are suggested. Students each choose one, but no book may be selected by more than four students. To help students select a book, the instructor describes what each book is about and also hints about the difficulty of the book. This proves essential in a nonmajors course, in which some students will have significant biology background and hope to challenge themselves while others are overwhelmed by the new materials and want to explore a safer option. Some book suggestions suitable for a freshman biology course are outlined in Table 2.

The instructions are provided to students in the form of a template for the assignment (Table 3). Students are told that in this assignment they will do the reverse of what they do when writing an essay. Writing an essay typically begins with creating an outline in which the paper's thesis and main arguments are identified. This outline then serves as the scaffold to write the paper. Here they are given someone else's finished work and must work in reverse to deconstruct its structure to identify the intended thesis and arguments. In effect, they are producing the outline for their book. The familiarity of the output format (an outline) reduces anxieties and focuses students on the task at hand: recognizing a thesis and its supporting scientific arguments.

Students are warned that they should work on their assignment while they read; they shouldn't wait until they have finished the entire book. It is important to stress to students that in addition to being accurate, each thesis statement should aim to be specific. Many students struggle to understand the difference between a thesis statement and a sentence that could be an alternative title for the chapter or book. It's important to flesh this out with students at the beginning of the assignment. A thesis statement is a declarative sentence (i.e., not a question, a command, or an exclamation). It's the author's take-home message – what he or she is driving toward. Importantly, it must be arguable. It should be provided as a complete sentence, and its meaning should be clear to someone unfamiliar with the book. Here are examples from past student work (both examples describe the same book chapter):

Thesis statement:

“The creation of a proton gradient is a universal process used by all life forms on Earth to extract and store energy from the environment”

Not a thesis statement:

“How protons solve the ATP mystery”

While both convey that the student is familiar with the contents of the chapter, the former is focused, informs a reader unfamiliar with the work, and is a claim defensible with arguments.

To guide students, a list outlining criteria that make a good thesis statement and good arguments is provided (Table 4). These serve as evaluation criteria for the assignment. Instructors may choose to read the entire assignment; alternatively, they may elect to read the sections summarizing the entire book (“Main Thesis of the Book” and “Main Arguments”) and then randomly select three chapters for assessment. This strategy has been used after several years of experience with this assignment and the observation that a student's performance does not vary substantially in quality from one chapter to the next. When using this assessment strategy, students are told at the start of the assignment to do each chapter diligently and that three chapters will be randomly selected for assessment. These three chapters are the same for all students reading the same book.

This assignment is typically followed by a “book club” in which students who read the same book meet to discuss it. Instructors planning to implement this activity are advised to add a few sections to the assignment. These include an author biography, a student critique of the book, the identification of one memorable quote, and three questions raised by the book (what would they like to ask the author?). These sections of the assignment serve as fodder for discussion between teammates. It is also an opportunity for peer teaching and for students to deepen their understanding of the book. Small-group discussions lead to a class presentation in which each team shares their book with the whole class. The purpose of the presentation is to practice communication skills, and it has the potential to make students enthusiastic about the prospect of reading additional books.

Table 2. Suggested popular life science books (and their authors) grouped by topics. The list includes classics and lesser-known but intriguing works. The books vary in length and in difficulty (i.e., the extent to which they interweave a description of experiments into their narrative), but all were written with a general audience in mind. Complete information for each is given in the References.

Books on Evolution	Books on Molecular Biology
<i>Beak of the Finch</i> , Weiner	<i>Double Helix</i> , Watson
<i>Life Ascending</i> , Lane	<i>Immortal Life of Henrietta Lacks</i> , Skloot
<i>Red Queen</i> , Ridley	<i>Power, Sex, Suicide</i> , Lane
<i>Selfish Gene</i> , Dawkins	<i>Survival of the Sickest</i> , Moalem
<i>T. rex and the Crater of Doom</i> , Alvarez	<i>Tears of the Cheetah</i> , O'Brien
<i>Your Inner Fish</i> , Shubin	<i>Time, Love, Memory</i> , Weiner
Books on Ecology	Books on Infectious Diseases
<i>Gaia</i> , Lovelock	<i>Coming Plague</i> , Garrett
<i>Guns, Germs, and Steel</i> , Diamond	<i>Fatal Flaws</i> , Ingram
<i>Silent Spring</i> , Carson	<i>Flu</i> , Kolata
<i>Song of the Dodo</i> , Quammen	<i>Malaria Capers</i> , Desowitz
<i>Where Do Camels Belong</i> , Thompson	<i>Missing Microbes</i> , Blaser
Books on Nutrition	Books on Neurosciences
<i>Food Politics</i> , Nestle	<i>Invisible Gorilla</i> , Chabris & Simons
<i>Good Calories, Bad Calories</i> , Taubes	<i>Man Who Mistook His Wife for a Hat</i> , Sacks
<i>Gulp</i> , Roach	<i>Mirroring People</i> , Iacoboni
<i>Mindless Eating</i> , Wansink	<i>Synaptic Self</i> , LeDoux
<i>Omnivore's Dilemma</i> , Pollan	<i>Why Zebras Don't Get Ulcers</i> , Sapolsky

Table 3. Assignment instructions distributed to students. These instructions are in the form of a template. Section headings are in bold, followed by the information that students should include in each section.

Book Outline
Name: Your full name
Course Name and Number: Course name (course number)
Assignment Due Date: Due date
Book Reference
Complete reference for the book in APA format.
Main Thesis of the Book
What is the author's main take-home message for this book? Distill it in a sentence or two (aim to be concise), taking the form of a thesis statement. Remember that a thesis statement must make a claim that is defensible and is not merely a statement of facts or opinion. The thesis should be specific; it should limit its scope to only the claims made by the author. It should be written so that any reader can understand the author's claim, even if they are unfamiliar with the book. To that end, use descriptive and precise language and include sufficient details. Your thesis should be clear and written in a complete sentence. Your thesis should be accurate, inasmuch as there is sufficient evidence to back up your claim that this was the author's main goal in writing the book.
Main Arguments
How did the writer make his or her case for the thesis? Identify the 3–6 main lines of evidence advanced by the author to convince the readers of the thesis. These should be the broad arguments in support of the thesis rather than the individual

Table 3. Continued

Book Outline
experiments or anecdotes (note, however, that some authors use landmark studies or events as key lines of evidence in support of the main thesis). The main arguments often, though not always, follow the chapter structure. Write each main argument in a complete sentence that could stand alone and be understood by someone who is unfamiliar with the book (this person should be able to logically follow how that argument supports the thesis). In other words, if you were creating the outline for this book, what 3–6 main arguments would you use to organize the body of your outline and defend your thesis? Format each argument as a separate item in a bulleted list.
Repeat the instructions below for every chapter in the book (including the Foreword, Introduction, and Epilogue; but excluding Glossary, References, and Appendices).
Chapter Thesis
Provide a one-sentence thesis statement for each chapter. Use information provided above for the main thesis of the book for guidance on what constitutes a good thesis statement. Write it using a complete sentence, write it in bold so that it is easy to identify, and include hints such as chapter numbers so that the reader knows which chapter it is summarizing.
Chapter Arguments
Identify the main lines of evidence in support of the chapter's thesis. Were specific experiments described as evidence for the thesis? Were examples or anecdotes told to drive home the point? Were logical inferences described? Select the 3–5 most convincing ones. Write each one in a complete descriptive sentence that would allow a reader unfamiliar with the chapter to understand how each point supports the chapter thesis. Format each argument as a separate sentence in a bulleted list.

Table 4. Evaluation criteria used in the assessment of student work.

Thesis Statement (Whole Book or Chapter)
Accuracy The chosen thesis reflects a fundamental aspect of the book or chapter and demonstrates evidence that the main point of the book or chapter was understood. The thesis is defensible and is a clear organizing point for the book or chapter.
Focus The thesis is informative, focused, and well defined. It avoids vagueness and generalities. It establishes a narrow and concrete scope that captures the specific direction of the book or chapter. It is concisely stated using precise words.
Clarity The thesis sentence is free of ambiguities and does not make use of jargon without first defining it. The sentence stands on its own and makes sense to someone unfamiliar with the book or chapter.
Format The thesis is stated as a complete declarative sentence, not as a question, command, or exclamation.
Sentence Structure Text is free of grammatical, spelling, or punctuation mistakes. Language is easy to interpret. Unnecessary words that do not advance the thesis, such as “the reason why is that . . .” are eliminated.
Arguments (Whole Book or Chapter)
Logic The evidence is mentioned in the book or chapter and clearly supports the chosen thesis. The way in which each argument supports the thesis is made clear (i.e., a reader should be able to follow the logic of including these arguments to support the thesis even if they are unfamiliar with the book).
Levels of Evidence The relevant and most important arguments in support of the thesis are identified. This shows evidence of making a distinction between the levels of information presented. The arguments supporting the <i>Main Thesis of the Book</i> should be broad, whereas those supporting a <i>Chapter Thesis</i> are more likely to be in the form of specific examples, anecdotes, and experiments.
Clarity The arguments are phrased in such a way that they are easy to understand. They are free of ambiguities and do not make use of

Table 4. Continued

Thesis Statement (Whole Book or Chapter)
jargon without first defining it. Each argument stands on its own, and the sentence makes sense to someone unfamiliar with the book or chapter.
Format
Each argument is stated as a complete declarative sentence, not as a question, command, or exclamation. Each argument is presented in its own bullet point.
Sentence Structure
Text is free of grammatical, spelling, or punctuation mistakes. Language is easy to read. Unnecessary words that do not advance the sentence, such as “the reason why is that . . .” are eliminated.

○ Student Response

The student response to this assignment has been quite positive. Few report that they had read a popular science book prior to this assignment, and many express that the personal narratives recounted in the works make science more accessible. Students generally leave with a positive attitude toward popular science books.

I initially modified the book report assignment in response to my dismay that some students seemed to understand individual experiments but failed to understand how they served as evidence for a larger thesis. Since the task of this assignment is specifically to do that, it forces students to structure the information provided in the book. In class discussions, students often express surprise that they hadn't understood that individual experiments were the evidence for a thesis, in the same way that textual evidence from a piece of fiction is evidence in an essay. Whenever students raise this comparison, I feel that I have achieved my goal for this assignment.

Some students struggle with writing good thesis statements, but this is easily corrected by giving in-class examples and exercises early in this assignment to provide feedback. The book club portion of the assignment provides peer feedback on their ability to correctly identify theses and arguments in their book.

Reading an entire book and producing its outline is a large project. At the start of the assignment, I impress upon students the assignment's scale and provide a planning document that helps them divide the work evenly throughout the course (e.g., they divide the number of chapters in their book by the number of weeks in the course, and this tells them how many chapters they should read and summarize each week in order to stay on task). I periodically check in with my class to remind them to stay on top of their project. Some students ignore this advice and wait until the last minute to do the work. Most manage to pull through, but it is a stressful and unpleasant time, and when they speak to their peers they realize the benefits of staying on task and planning the work. This is a valuable lesson.

Inevitably, there is some resentment about the fact that some books are more difficult than others. Instructors may wish to mitigate this by selecting books of similar difficulty and/or length. Students also express discontent with the fact that only three chapters are evaluated and often demand to know which ones will be evaluated ahead of time. Unless the instructor plans to have students do a close reading of only certain chapters, this approach is discouraged; the goal of not announcing which chapters will be evaluated is to force students to do their best on all of them. A three-chapter “sample” is sufficient in assessing the quality of the work.

This assignment forces students to deconstruct and analyze a text in order to understand how scientific evidence is brought forward in support of a thesis. It requires close reading and rigorous analysis, is simple to implement and easy to mark, gives students choice in their book selection, and introduces them to a type of resources that they are likely to encounter after graduation. It may therefore serve to foster learning skills about the sciences that extend beyond the boundaries of the classroom.

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