

“Reading” Science

strategies for critically interpreting science “texts”

Intro

Paper Tiger's “Donna Haraway Reads the National Geographic on Primates,” brings into question the contexts in which scientific knowledge is created. Throughout the video, Haraway reiterates the phrase “what gets to count as nature, for whom and when and who much it costs to produce nature at a particular moment in history for a particular group of history.” She indicates that these are the questions of a cultural critique. They are also the questions of critical media literacy.

Working from key concepts and questions used in critical media literacy, this guide is intended to provide a first few steps towards the exploration of science texts as cultural enterprises. It's primary focus is on the artifacts and products of scientific research. The idea is that through a critical examination of science “texts”, one can begin to understand a range of forces and influences operating in the science knowledge production environment.

Key Concepts

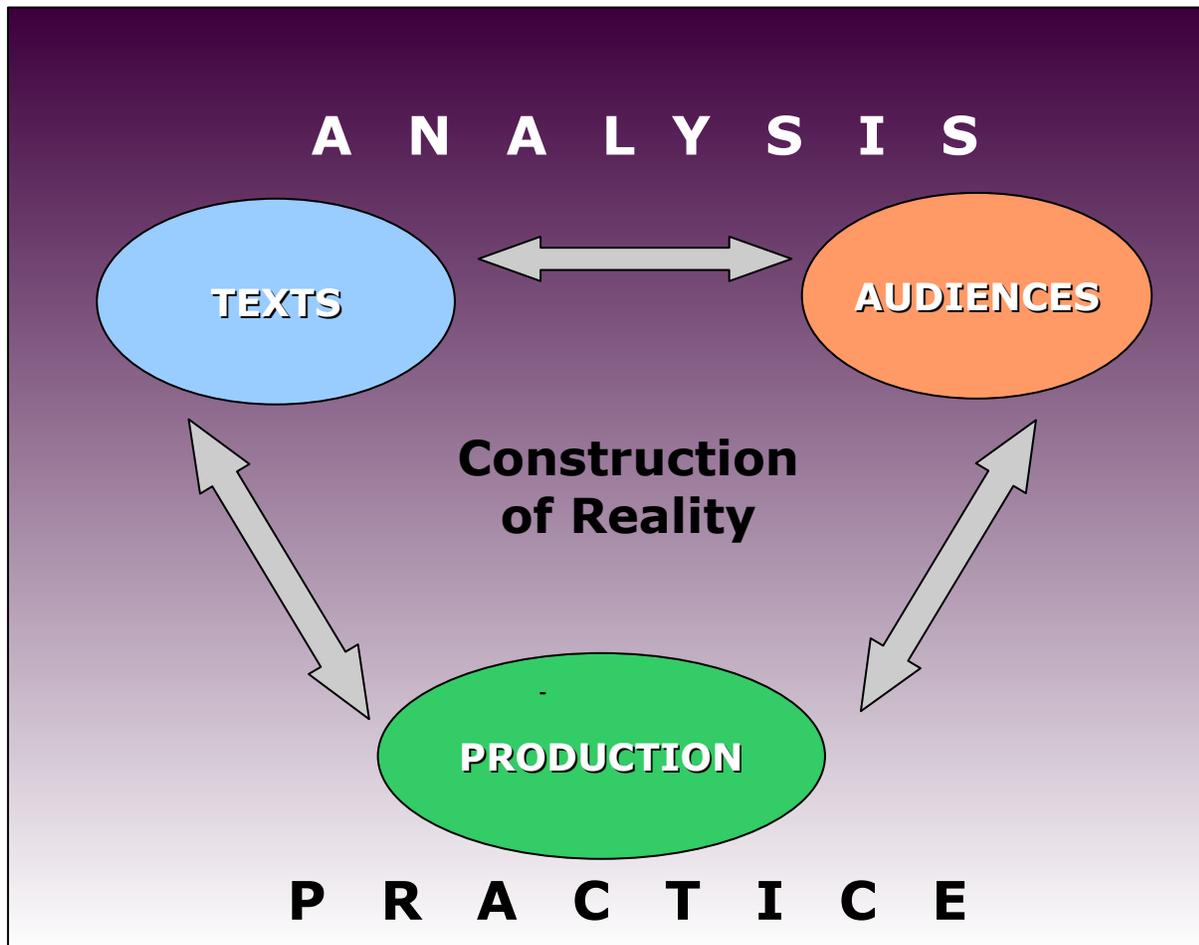
(adapted from material found at: http://www.media-awareness.ca/english/teachers/media_literacy/key_concept.cfm)

1. All scientific “texts” are constructions
2. Scientific “text” construct a reality
3. Audiences negotiate meaning in their reading of scientific “texts”
4. Scientific “texts” have commercial implications
5. Scientific “texts” contain ideology and values
6. Scientific “texts” have social and political implications
7. Form and content are closely related in the presentation of scientific “texts”
8. Each scientific discipline has a unique set of conventions and methods and present these in specific “textual” forms.

Key Questions

(adapted from material found at: http://www.media-awareness.ca/english/teachers/media_literacy/key_concept.cfm)

1. Who produced this scientific “text”?
2. What techniques are used to convince me of its validity?
3. How might different people understand this “text” differently from me?
4. What lifestyles, values, and points of view are represented in or omitted from this “text”?
5. Why was the underlying research conducted and presented in this form?



Texts

examination of conventions (textual, graphic and symbolic), methods, approach and disciplinary boundaries, and format of the specific scientific artifact

Production

evidence of technology and tools used to support research, financial and institutional support of the research as well as publishing / production organization, ownership and control of research process and products including editorial control, evidence of research practices, institutional configurations, mechanism for knowledge sharing (i.e. peer review, open access), standards of legitimacy (i.e. prestige, reputation, acknowledgment), and other social-structural elements

Audiences

influences on the reader / interpreter (i.e. culture, gender, race, age, expertise, education), context of use, ability to actively read or choose textual meaning, position vis-a-vis researcher / author, understanding of the relevance science knowledge to specific contexts

Adapted from a graphic found at:

http://www.media-awareness.ca/english/resources/educational/teaching_backgrounders/media_literacy/perfect_curriculum_1.cfm

Sample Exercises

Exercise 1: Communicating Science

(based on a exercise developed by Jinnie M. Garrett - Biology Department, Hamilton College - <http://sicw.wikispaces.com/n05ScienceCommunication>)

Objective

This exercise should sensitize participants to the varied ways in which scientific information can be disseminated. Ideally, participants should complete the exercise with a deeper understanding of the how different scientific products and artifacts (i.e. publications): 1) are shaped to meet the needs of specific audiences; 2) include or exclude information depending on these audiences; 3) have specific institutional supports (i.e. finances, peer support; and 3) communicate both intended and unintended messages depending on form and content of the artifact.

Step One

Separate the group into teams assigning each team a single “text.” When choosing “texts,” the group facilitator should keep in mind a variety of ways in which scientific knowledge is disseminated. The “texts” can come from popular magazines, personal essays, academic peer reviewed journals, television and radio programs, websites, documentaries as well as a range of other formats. Ideally, all “texts” should originate from a similar scientific research source (i.e. genetic testing, clean energy, etc). Here is a paired example:

Building Nanobristle Structures on Science Friday (NPR)
<http://www.sciencefriday.com/program/archives/200901095>

"Self-Organization of a Mesoscale Bristle into Ordered, Hierarchical Helical Assemblies", B. Pokroy, S. H. Kang, L. Mahadevan, J. Aizenberg, Science 2009, 323, 237-240. Accessible at: <http://www.sciencemag.org/cgi/content/full/323/5911/237?ijkey=SG8ei9hGh8Vcg&keytype=ref&siteid=sci>

Step Two

Each group should consider the following questions in the examination of the text:

- Who is communicating?
- What is their goal in producing this text?
- Who is the intended audience?
- What do you know from this text?
- What evidence supports the conclusion?
- Is there information missing?
- Does the format of the text support or detract from the information presented?

Step Three

Each group presents their discussion of their text to the larger group. The facilitator's role is help students compare and contrast the different formats presented and understand the pros and cons of how each disseminates scientific knowledge.

Exercise 2: The Role of the Researcher

Objective

This exercise is designed to show how the researcher influences the nature, scope and focus of scientific knowledge creation. It is also designed to sensitize the reader to their own cultural assumptions and biases in assessing the value and validity of scientific knowledge. A secondary objective of the exercise is engage students in questions about the environments in which science knowledge is produced as well as resources available

Step One

Participants individually, in small groups, or as a whole should be asked to consider different types of researchers. They should take some time to create a mental map of the researcher by putting themselves in the researcher's place.

The individuals listed below are engaged in some aspect of scientific knowledge creation in the Masai Mara (http://en.wikipedia.org/wiki/Masai_Mara) in East Africa:

1. fourth grade science teacher
2. eco-tourism operator
3. zoologist for the San Diego Zoo
4. biologist for a top tier academic institution
5. geologist working for an oil company
6. pastoralist herder and family
7. science writer for National Geographic
8. environmental impact specialist working with a developer

Step Two

The instructor or group facilitator then guides the group through a series of questions such as these:

- What might be the goal of each of these individuals in the pursuit of scientific knowledge?
- Who is each sharing their knowledge with? Is there more than one audience?
- What resources do you envision each person having at their disposal to conduct their research?
- What are the methods each uses to produce their knowledge?
- Whose knowledge is most valued and by whom?
- What is the mental image you have of each of these subjects? Consider gender, race, country of origin, age, status and other identity markers. Where do these mental images come from?

The discussion should help participants understand how researchers are motivated by their specific contexts. The facilitator should also help participants understand how the participant's own biases and personal perceptions interact with their construction of these hypothetical researchers.

Some Resources

Reading Science Texts

The Authenticity Filter: Lessons from Photoshop on Biological Engineering

<http://www.scienceprogress.org/2009/02/the-authenticity-filter/>

An example of how Photoshop can create modified visualizations that impact the ways in which we “see” scientific research. Can be useful in critically assessing images, graphics and other visualizations presented in scientific “text”.

Metaphors in Science and Art: Enhancing Human Awareness and Perception

http://ejse.southwestern.edu/volumes/v11n1/articles/art01_ashkenazi.pdf

Explores that ways in which science as a creative process constructions metaphors that shape our understanding of how we understand science knowledge. Helpful in considering the types of metaphorical structures that may influence or shape our understanding.

The Role of Language in Science

<http://www.f davidpeat.com/bibliography/essays/lang.htm>.

Looks at how language works to create our ideas of the world around us. In the world of science the same work can be used to mean different things as new bodies of knowledge come online. Article is useful in sensitizing need to understand key terms within the context of their research environments.

Writing, Literacy, and Technology: Toward a Cyborg Writing (from *Women Writing Culture*)

http://www.jacweb.org/Archived_volumes/Text_articles/V16_II_Olson_Haraway.htm

An interview with Donna Haraway in which issues of being “technoscience” literate are

addressed in which all science “texts” are placed in a cultural context.

Mathematics as Sign: Writing, Imagining, Counting

<http://www.sup.org/book.cgi?id=415>

This book explores the semiotics of mathematics as a human-centered method of communication that is based in the creative mental processes and social contexts.

Deconstructing Science

http://www.ibiblio.org/wunc_archives/sot/?p=150

An NPR interview with Priscilla Wald, professor of English at Duke University, who discusses how distorted depictions of research can create unfounded fear and anxiety.

Media Literacy Supports

Action Coalition for Media Education: Questioning Media Toolkit: -

http://www.acmecoalition.org/files/ACME_questioningmedia.pdf

These 10 basic principle of media can augment the critical concerns and questions addressed at the beginning of the guide. This two-page flyer gives simple concepts to shape critical media examinations.

Media Awareness Network

<http://www.media-awareness.ca>

This Canadian-based site provides educators, teachers, and parents with a range of media education tools, research and strategies. The site promotes itself as the “world’s most comprehensive collections of media education and Internet literacy resources”