CONTENT-ANALYTIC STUDIES OF SCIENCE NEWS: INNOVATIONS AND OPPORTUNITIES

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Abstract

This paper argues that researchers interested in popular science news can build more sophisticated content analytic research programs by (1) more directly pursuing issues of language, borrowing as needed from recent work in linguistics and rhetoric, and (2) reaffirming and rearticulating the connection between content analytic research and social theory. This latter suggestion entails abandoning the translation view of scientific popularization and going beyond a narrow focus on prestige publications and natural science. In addition, this paper urges researchers to investigate electronic and visual communication of science and to reconsider the role of computers in content analysis.

Certainly, there is no shortage of content-analytic studies of science news – more than 100 content-analytic studies of science news have been published to date.[1] To its credit, the young journal *Public Understanding of Science* has already published several quite good content analyses (Clayton, Hancock-Beaulieu & Meadows, 1993; Einsiedel, 1992; Entwistle & Hancock-Beaulieu, 1992; Friedman, Gorney & Egolf, 1992; Wartenberg & Greenberg, 1992), acknowledging the crucial role of media artifacts and representational practices in the public understanding of science.

Although content-analytic studies of science news are common, these studies often lack sufficient theoretical scope and coherence. Many studies utilize a narrow "translation" model of popularization in which popular science journalism is implicitly or explicitly held to the standards of formal science writing (and as a result is almost always found wanting). In addition, studies of science news are too often limited to elite news outlets and too frequently concerned only with news of the natural sciences. Researchers must make a more systematic effort to

assess the content and social function of news about various forms of human inquiry, broadly defined, aimed at various audiences. In other words, content analysts must strive to document and understand the rich diversity of popular representations of human inquiry.

But before researchers can adequately address these domain-specific concerns, they must deal with six more fundamental and seemingly more intractable problems endemic in content analysis in general: (1) the tendency to treat language as a black box – a tendency that has prevented content analysts from utilizing potentially valuable recent work in linguistics and rhetoric; (2) the neglect of social theory, resulting in a failure rigorously to assess popular media content in its social context; (3) a continuing focus on print media even as we enter the era of electronic communication; (4) a continuing focus on written rather than visual communication; (5) a focus on news rather than media offerings in general; and (6) a too narrow conceptualization of the role of computers in content analysis.

As a result of these limitations, content analysts find themselves ill-equipped to defend, let alone champion, content-centered research. This paper suggests how researchers interested in popular representations of science might develop more sophisticated content-analytic research programs. Moreover, this paper suggests how researchers might develop research programs appropriate for the era of global electronic communication. Indeed, as communication about science grows almost exponentially, content analysis becomes indispensable in monitoring and understanding science news flows. We must learn to harness, for scholarly purposes, the torrent of science news flowing from media outlets around the world.

Beyond the Translation Model

Scientists and media researchers alike tend to see popularization of science as at best a translation and at worst a vulgarization of scientific knowledge (Hilgartner, 1990). In this view, the journalist's role is to translate the findings of scientists using appropriate simplification and with minimal distortion. This view privileges scientists as discoverers of genuine, pure knowledge and in its most extreme manifestations produces studies narrowly concerned with science news accuracy (e.g., Molitor, 1993; Tankard & Ryan, 1974). Dornan (1990) rather cynically

suggests that the academic "science in the media" project is "inextricably allied with efforts of scientific organizations to engineer dutiful coverage and to create a public that will accede to science's claims to rational authority" (p. 64). Hilgartner (1990, p. 519) more cautiously notes that the translation view "provides a powerful tool for sustaining the social hierarchy of expertise." I do not mean to suggest that content analysts should stop documenting errors and omissions in science news. This is an important task. Still, content analysts should look not for *misrepresentations* but rather *alternative* or *variable representations* of science. Content analysts should be concerned primarily with determining (1) what kinds of audiences receive what kinds of representations of science, and (2) how this variation in content is linguistically, rhetorically, and socially patterned. Content analysts should seek not to police corruption of scientific truth, but rather to document and explain differences in content across audiences and social contexts.

Beyond Elite Publications

Elite publications such as the *New York Times* are overrepresented in science news studies in proportion to their readerships. Certainly, elite publications are worthy of study, but too often it seems elite publications are studied in part because they are more readily accessible (i.e., better indexed and more commonly available in research libraries) than non-elite publications. Too few studies of elite science news do enough to consider the sources as elite *per se*. Worse, some studies implicitly use elite media coverage as a surrogate for "general" media coverage of science, as if findings regarding news content aimed at a small, albeit influential, portion of the population were generalizable across publications aimed at other types of audiences. It is heartening to see smaller-circulation and ethnic publications increasingly made available electronically, although researchers have been slow to exploit these new resources to assess the socially-patterned nature of science news.

Beyond Natural Science

Because content analysts typically limit their attention to news of research in medicine and the physical sciences, they overlook many areas of media coverage directly relevant to understanding public conceptions of human inquiry. For example, news of social science research is routine in daily newspapers, yet there

exist few studies of this coverage (for exceptions, see Evans, 1994; Weiss & Singer, 1988). Similarly, stories of unorthodox (or pseudo) science are common, especially in working-class publications such as supermarket tabloids, yet this rich source of public discourse about science has been largely neglected by content analysts. We need more comparative studies of news across various forms of human inquiry as well as across publications aimed at various audiences. Without comparative studies, we will remain unable to develop an integrated model of how mass-mediated science cultivates public conceptions of what is good (or dangerous) to know, who is qualified to investigate various phenomena, by what methods, and to what ends. In addition to studies of news coverage of specific issues and areas (e.g., biotechnology), we need studies that assess the role of news in public conceptions of inquiry in general.

Of course, these problems can be addressed merely by adjusting research agendas, although in many cases such adjustments may be gross rather than fine. Researchers interested in science news must also deal with several limitations endemic to content analysis in general.

Appropriating Linguistics and Rhetoric

Paradoxically, content analysts have long been interested in texts but uninterested in language. To be fair, the neglect of language has been understandable, perhaps even defensible. After all, content analysts are not typically interested in texts as evidence of linguistic competencies, cognitive processes or structures, or psychological states (for exceptions, see Gottschalk & Gleser, 1969; O'Dell & Weidman, 1993), or as instrumental rhetorical acts, but as a way of assessing the range of the symbolic resources provided by mass media. Content analysis' roots in mid-twentieth-century sociology have long encouraged researchers to frame research questions (however loosely and unsystematically) in terms of sociological concepts and theories. To generalize perhaps too broadly, content analysts have been interested in how *social structure* rather than *language* is manifested in popular media. Methodologically, this orientation often entails a focus on rather large units of analysis (i.e., entire news stories as opposed to sentences or words) at the expense of a more detailed examination of language.[2]

Of course, this rigid distinction between language and social structure has always

been arbitrary (if common) and is increasingly untenable as recent work in many fields – including linguistics, discourse analysis, rhetoric, and communication – provides the resources to develop more unified theories of language, texts, and social structure. Researchers interested in science news are particularly fortunate in that much of the most innovative recent work in rhetoric and linguistics oriented toward micro-macro unification deals extensively with scientific texts. In rhetoric, the work of Bazerman (1988), Latour (1987) and others (e.g., Fahnestock, 1986; Myers, 1990) shows how scientific genres and specific textual choices can be studied from their sociocultural contexts. In linguistics, Halliday and Martin's (1993) work on scientific texts (both popular and academic) from the perspective of systemic functional linguistics provides many resources for the content analyst looking to examine socially-situated language and socially-patterned textual variations.

Halliday and Martin's work is typical of the renewed interest among linguists in developing grammars that go beyond sentence structure to consider issues of meaning and social structure. Content analysts have already produced some promising results using semantic text grammars (Franzosi, 1989, 1990) and "cultural" grammars (Colby *et al.*, 1991). Furthermore, researchers interested in science news need not wait for linguists to develop new systems. Eltinge and Roberts (1993) present a promising analysis of science textbooks in which they assess only basic sentence elements (subjects-verb-compliment) to determine how frequently textbooks portray science as a process as opposed to a collection of facts and techniques. In short, content analysts can do much merely by attending to language, even in lieu of fully developed, holistic theories of language, text, and society.

Toward a More Rigorous Conception of the Social

While content analysts must open the black box of language, they must also take care to draw from their roots in social theory. The seminal content analysis research programs of Lasswell (e.g., Lasswell *et al.*, 1949) and Berelson (1952) were centrally concerned and routinely engaged with social theory. As communication evolved as a discipline, however, researchers increasingly failed to pursue links to social theory. Today, content analysts seldom acknowledge their debt to social

theory, and even less frequently frame research questions explicitly in terms of social theory. Unfortunately, content analysts have developed few viable theoretical foundations of their own; indeed, the few theoretically informed content-analytic research programs owe much to social theory (e.g., Gerbner *et al.*, 1986; Thomas, 1989).

Science news research especially needs a more rigorous definition of the social. Any research program that tries to understand the rich variety of science news consumed by various audiences must offer explicit notions of social structure. I do not mean to champion any one particular branch of social theory. Instead, I want to suggest that researchers must be offered richer and more explicit theoretical contextualization of content analytic data.[3] We need theoretically-informed, comparative studies of science news in publications aimed at audiences that differ in terms of social class, ethnicity, and gender. Whenever possible, science in the media must be linked to its social functions.

From Print to Electronic Media

Although most people rely most heavily on television as a source of news (including science news), content analysts continue to limit their studies largely to print sources, in part because print is more accessible and in part because print sources (particularly prestige newspapers) are seen as providing a "standard" or baseline measure against which news content in other media can be compared, usually in terms of accuracy, story depth, and so forth. As a result, content analysts have offered little insight into television as a medium (except to confirm the rather unremarkable point that television offers more simplified news than print sources). Indeed, content analysts are unprepared to understand media content in the coming era of electronic communication. What are the relevant and unique features of popular science news produced for electronic, interactive retrieval? Researchers must work toward building content analytic theories and methodologies informed by theories and research in electronic communication, human-computer interaction, and hypermedia (e.g., Barrett, 1992; Bolter, 1989).

Among other things, this will entail a shift from an almost exclusive concern with written communication toward including visual communication within the purview of content analysis. As Kepplinger (1989) notes, studies of television news

seldom consider visual imagery, focusing instead on the text. There have been few content analytic studies of visual imagery in science news (for an exception, see Evans, 1992), although there exist several promising semiotic studies of popular science imagery (e.g., Jacobi & Schiele, 1989, 1993). For the most part, content analysts have yet to develop tools with which to consider visual imagery.

Beyond the News-Entertainment Dichotomy

Audiences seem less and less inclined to distinguish between news and entertainment, and there seems to be less reason to do so as tabloid journalism, "reality-based" television, and television docudramas blur the distinction. Yet content analysts – including those interested in popular science – continue to make a sharp distinction between news and entertainment, studying the former while neglecting the later, despite the fact that the news-entertainment dichotomy has always been somewhat arbitrary. After all, like entertainment, news is a form of storytelling. Science news, for example, does not function primarily to educate readers and viewers about specific scientific events, but to reaffirm a view of the role of science and scientists in society (see Carey, 1989). Researchers interested in science news should become better acquainted with the work of anthropologists (e.g., Bird, 1992; Hess, 1993), film scholars (e.g., Tudor, 1989), literary critics (e.g., Selzer, 1993) and others who have investigated the stories we tell one another about science. Certainly, content analysts could do more to develop methodologies and coding strategies that would facilitate cross-genre comparison of results.

A New Role for Computing in Content Analysis

Since the introduction of the General Inquirer computer program in 1966 (Stone *et al.*, 1966), researchers have developed several programs to automate textual analyses (see Hart, 1985, and Lancashire, 1991, for a review of these programs). Unfortunately, most programs developed to date require that the researcher apply one more-or-less fixed dictionary (or at best a set of dictionaries) to all forms of content. In return for the unquestionable benefits of automated text processing, these programs ask researchers to sacrifice the ability to tailor coding categories and procedures to specific research questions. In other words, these programs ask one to sacrifice flexibility for automation. As a result, these programs remain underutilized.

Still, there remains a largely unmet demand for the power of computing in content analysis. Content analysts are increasingly utilizing commercial fulltext retrieval programs (e.g., askSam, ISYS, Personal Librarian), not because these programs automate analyses, but because they facilitate human coding of large databases. Recently developed computer-coding procedures (Fan, 1988; Nacos *et al.*, 1991) and computer programs like the Ethnograph (Seidel & Clark, 1984) and PLCA (Eltinge & Roberts, 1993; Roberts, 1989) allow researchers to devise and apply customized textual coding procedures. These procedures and programs intimate a crucial change in thinking about the role of computers in content analysis. Instead of seeing the computer as a surrogate analyst, we must reconceptualize the computer as an environment in which researchers can devise and apply more creative and theoretically richer coding schemes, even if these coding procedures require human intervention (Evans & Ruby, 1994). Fully automated and yet customizable computer analysis of content is an admirable goal, but it remains perhaps as elusive now as it did when the General Inquirer was introduced. For the next several years at least, we must use the computer as an environment rather than a substitute for human coding.

Issues of computing in content analysis are particularly timely given the rapid growth of electronic news dissemination and online databases. While the computer cannot yet replace the human coder, it can provide access to a wide variety of electronic texts. The texts of most major U.S. newspapers, magazines, and television newscasts are readily available online.[4] Relatively few small-circulation, alternative, non-English, and non-U.S. publications are available online, but this seems likely to change soon. In terms of science news studies, this easy access to texts can facilitate more rigorous comparative studies of content across publications aimed at different audiences and across different forms of inquiry. It is imperative that researchers understand and exploit these electronic resources, especially since, as suggested above, science news content will likely be reshaped by interactive, electronic methods of disseminating, retrieving, and displaying information.

Conclusion

As Neuman (1989) notes, the history of content analysis records many unheeded

pleas for researchers to coordinate content-analytic efforts. From Lasswell's (1935) "world attention survey" to Rosengren's (1980) cultural indicators project, content analysts have tried repeatedly to enlist others in more-or-less coordinated research programs in hopes of improving our understanding of popular news. As well-intentioned as such efforts are, they seem doomed to failure. The diverse interests and approaches of content analysts mitigate against such projects. Therefore, I do not offer yet another call for coordinated research. Instead, I suggest that content analysts do more to articulate and develop the theories undergirding their research and to go beyond other limitations (e.g., the focus on print media, prestige news outlets, and natural science) that prevent them from realizing a holistic view of media representations of human inquiry. A pluralistic field in which well-articulated theoretical differences are many and perhaps even irreconcilable is to be preferred to a field that is unified but methodologically underdeveloped and theoretically unsophisticated.

The content analytic study of science news remains an immensely promising field, already full of underutilized theoretical, methodological, and technological innovations. Content analysts must do more to exploit these opportunities, especially since content analysis will be indispensable in documenting and understanding science news flows in the coming era of global electronic communication.

Notes

1. A complete bibliography of content-analytic studies of science news is available on request from the author.

2. There are notable exceptions. The General Inquirer computer program (Stone *et al.*, 1966) and its related research tradition (e.g., Namenwirth & Weber, 1987) examine words as the basic unit of analysis, and several methodological treatises recommend words as the unit of analysis due to concerns about the relatively lower reliability and validity typically associated with larger units of analysis (e.g., Weber, 1989); nevertheless, most content analytic studies use larger units of analysis.

3. Like all scientific data, content analytic data are never atheoretical. To be sure, content analytic data are often *under*theorized, but this suggests only the need for more rigorous attention to theory; it does not suggest, as some critics claim (Livingstone, 1989), that content analytic data are ill-suited for hypothesis testing and theory building. On the contrary, content analytic approaches are well-suited to theory building and offer several distinct advantages (such as unobtrusiveness and lower costs) over other methods of discovery such as survey research.

4. To date there are no publicly accessible electronic databases of television video or newspaper or magazine photographs, although this is likely to change soon. Already there exist electronic indexes of commercially available videotape (as well as transcripts) from U.S. television news outlets. This makes it easier for researchers to identify and obtain relevant television videotapes, but it does not of course solve the problem of the dearth of television images in public archives.

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