A framing analysis of the news coverage of science

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ABSTRACT

A FRAMING ANALYSIS OF THE NEWS COVERAGE OF SCIENCE

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This study investigated how the field of science is framed by the United States news media. One full year's (i.e., 2014) worth of science news from four newspapers (i.e., two prestige newspapers, *The New York Times* and *The Washington Post*, and two high-circulation newspapers, *The Philadelphia Inquirer* and the Minneapolis *Star Tribune*) was gathered and content analyzed in an attempt to determine the distribution of positive, negative, and neutral/ambiguous science news and to compare these distributions in different types of newspapers. Results of a content analysis of 425 (N=425) science news articles indicated that there were no statistically significant differences between the two newspaper groups (i.e., prestige and high-circulation newspapers) or between the four individual newspapers in terms of their distributions of positive, negative, and neutral/ambiguous science news articles.

This study did result with the general observation that there was a large amount of positive and neutral/ambiguous science news and a small amount of negative science news in all four newspapers. An interesting finding of this study is that there was a much larger amount of science news in prestige newspapers (i.e., in 2014, there were 984 science news articles in the prestige newspapers under investigation) than there was in high-circulation papers (i.e., in 2014, there were 179 science news articles in the high-circulation newspapers under investigation).

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CHAPTER 1: INTRODUCTION

The news media exert a great deal of influence over the public's knowledge and opinion of many local, national, and global issues (Berkowitz, 1997). Since the news media have such a powerful impact on the public's perception of reality, it is important to persistently re-evaluate the nature of news media content and how news media content is created (Shoemaker & Reese, 2014). There are a number of different issues to consider when analyzing news media content, and there are a number of different ways to approach the consideration of these issues. In this project, the framing approach to analyzing news media content will be utilized to study the way in which the field of science is framed by the news media.

The study of the news coverage of science is of great importance and worthy of pursuit. Not only can this expand our knowledge of the media (i.e., the formation and impact of media content), but positive news coverage of science could, as suggested by the existing body of research on the news media and public opinion, result in an increase in the public support of science and an increase in the rate of scientific progress (McCombs, Holbert, Kiousis, & Wanta, 2011).

In this study, the amount of news articles that framed a scientific issue with a positive tone will be compared to the amount of news articles that framed a scientific issue with a negative tone in order to illuminate the nature of the general attitude towards scientific progress that is promoted by the United States news media (i.e., in prestige newspapers, *The New York Times* and *The Washington Post,* and in high-circulation newspapers, *The Philadelphia Inquirer* and THE Minneapolis *Star Tribune*). Even though the framing approach has been utilized to study the news

coverage of scientific issues in past research, this study applies the framing approach to study science news from a different, more generalized perspective.

Following a review of previous research that (a) analyzed the news coverage of science, (b) utilized the framing approach to study news media, and (c) used the framing approach to study the news coverage of science (i.e., both a & b), new questions about the *general* nature of the news coverage of science will be asked. Then the method of the content analysis that can provide insight into these research questions will be clearly and thoroughly explicated.

This study will conclude with a discussion of the results, the nature and limitations of the research and, ultimately, with some implications about how the news media's framing of science, in general, is related to the public's respect, understanding, support, and awareness of science, in general. This is worthy of investigation because the findings of studies like this can, potentially, make possible the discovery of new ways to increase the public's support of scientific progress. It is asserted that the mere possibility of this increase in the public's support of scientific progress makes this study worthy of pursuit.

This Study's Definition of "Science News"

Before moving forward, it must be thoroughly clarified what kind of news content will be analyzed in this research project. In this study, "science news" will refer to news articles that deal with issues and events in what are known as the "hard" ("natural" or "empirical") sciences (e.g., medicine, astronomy, physics), in addition to news articles that deal with issues and events in what are known as the "soft" (or "social") sciences (e.g., behavioral sciences, psychology) (Friedman, Dunwoody, & Rogers, 1999; Pellechia, 1997).

The collective works of Friedman et al. (1999) provided the inspiration and the basis of this study's operational definition of "science news." In other, previous studies on the news coverage of science, like Pellechia's (1997), the definition of "science news" was more narrowly focused on the news coverage of what are known as the "hard" sciences (i.e., medicine/health, technology, and natural/physical sciences). However, because this study's scope is focused on the general investigation of the news media's duty to educate the public, news articles about the hard *and* the soft sciences will be analyzed because *both* provide insight into how the sciences are framed by the news media. In addition to articles about specific scientific issues, articles related to the education or communication of the sciences will also be analyzed (Pellechia, 1997).

In sum, "science news" will refer to any news article that is: (a) related to a specific issue in the sciences (e.g., technology articles about computer use in classrooms, psychology articles about the disadvantages of multitasking), (b) related to any field of the sciences (e.g., earth science, psychology), or (c) related to the communication and education of the sciences. It will become even clearer why these are the kinds of news articles that are most relevant to the research questions under investigation.

CHAPTER 2: LITERATURE REVIEW

The News Coverage of Science

The field of science, including all of its subfields (e.g., astronomy, medicine, etc.), is an exciting field that is always in a constant state of flux due to a rapid rate of new discoveries, findings, and growth. Scientists persistently continue to expand the boundaries of human knowledge and improve the human condition (via new medicine, technology, etc.). For these reasons, science and current issues in science are worthy of public understanding, or at least public appreciation, respect, and consideration.

A great deal of research has indicated that the news coverage of particular issues may be closely related to the public audience's opinion and support of those particular issues (McCombs, Holbert, Kiousis, & Wanta, 2011). So it seems safe to conclude that the public's awareness and support of scientific progress is greatly dependent upon the news coverage of science (Biro, 2014). It has been argued that scientific literacy among the American public is important and desirable, but that the nature of the United States news media's coverage of science is a factor that may contribute to the general American public's lack of scientific literacy (National Science Board, 2004). In fact, results of previous studies have indicated that science does not seem to receive a great deal of fair, accurate, or unbiased news coverage, or even a great amount of news coverage at all (Jensen & Hurley, 2012; Pellechia, 1997). This is a problem. Since past research has indicated that the public's awareness and support of scientific progress is greatly dependent on the nature of the news coverage of science and that science is not regularly, fairly, or accurately mentioned in the news, then it seems fair to infer that this may result in a much lower level of

public awareness and support of science than if science were covered in the news with more frequency, accuracy, and fairness (Friedman et al., 1999; Jensen & Hurley, 2012; Pellechia, 1997).

Frequency. Researchers have approached the study of the news coverage of scientific issues in many different ways and have made many interesting discoveries (Friedman et al., 1999). Pellechia (1997) conducted an exhaustive content analysis of every science article published in *The Chicago Tribune, The New York Times,* and *The Washington Post* over the span of three time periods: (a) from 1966 to 1970, (b) from 1976 to 1980, and (c) from 1986 to 1990 (p. 53). It was found that even though the news coverage of scientific issues is not very frequent (especially in comparison to the news coverage of other issues), stories about scientific issues in major United States newspapers *have* been gradually increasing in production and their frequency has been expanding over the past thirty years (Pellechia, 1997).

Accuracy. Researchers have not only analyzed the frequency of scientific news articles, but other dimensions of the news coverage of science have also been researched (Friedman et al., 1999). For instance, some researchers have thoroughly examined and compared the writing *style* of science journalists (Bucchi, 2013). It has been found that journalists who cover scientific issues go through a translation, or simplification, process when writing these articles in order to make the complex scientific issues more understandable to the general public (Scheu, Volpers, Summ, & Blöbaum, 2014). Even though some may feel that this results in inaccurate reporting because important facts about the particular scientific issue may be lost in this simplification process, this process is necessary because not everyone has a great deal of scientific knowledge and these people should, also, have at least a *general* understanding of the nature of current and important scientific issues (Scheu et al., 2014).

Fairness. Another important issue in the news coverage of science that has been studied is the impact of the news coverage of science on the credibility of scientists (Jensen & Hurley, 2012). After an examination of the complex consequences that result from the publication of conflicting news stories, Jensen and Hurley (2012) identified that this negatively impacts a scientist's credibility. It was concluded that the news coverage of science has a great impact on the credibility of scientists (Jensen & Hurley, 2012). This can be unfair because scientists are not always granted the opportunity to fully explain the significance of their findings or to clarify why their findings may be inconsistent with those of another scientist (Jensen & Hurley, 2012). This study illuminated the valuable lesson that the news coverage of science is a complex issue which greatly impacts the public's support not only of particular scientists but of specific scientific fields and of scientific progress in general (Jensen & Hurley, 2012).

It is clear that the news media exert a great deal of influence over the public's perception, that a great deal of research has been done on scientific news content, and that this research, collectively, suggested that the news coverage of science may be closely related to the public's awareness and support of scientific progress (Friedman et al., 1999; Jensen & Hurley, 2012; McCombs et al., 2011; Shoemaker & Reese, 2014). Now there will be an explication of media framing theory, followed by a discussion of research that that has utilized a framing approach to understand the formation and the impact of science news content, and then a brief description of the framing approach that will be utilized to study the general nature of science news in this project.

Framing News Media

       The evolution of media framing theory. As eloquently stated by Gitlin (1980), who was one of the first scholars to use the framing approach to study news media content, "Frames are principles of selection, emphasis, and presentation composed of little tacit theories of what exists, what happens, and what matters" (pp. 6-7). This framing approach to understanding news media content involves the consideration of the idea that journalists write (i.e., "frame") news stories from perspectives that are partial towards certain viewpoints and that this practice has an influence on the public's interpretation of events (Luther & Miller, 2005; Tankard, 2001). Quite often, readers may not even realize that they are reading a news story that may have been written from a partisan perspective. In addition to Gitlin (1980), many other scholars have expanded the existing body of media framing research.

       Entman's (1993) study can serve as a great outline of the fundamental elements of the framing approach to studying news media content. Entman (1993) identified four components of how controversial issues are framed in news stories: (a) how the problem is defined, (b) how the cause of the problem is interpreted, (c) how the moral issues are evaluated, and (d) how the treatment of the problem is recommended. These four components are crucial elements in news stories that can have a great impact on the public's understanding of events (Entman, 1993). In recognizing all four of these crucial components of a given news story, one can identify from what perspective that news story was framed (Entman, 1993).

       Tankard (2001) defined a media frame as "a central organizing idea for news content that supplies a context and suggests what the issue is through the use of selection, emphasis, exclusion, and elaboration" (pp. 100-101). Tankard's (2001) study was quite significant to the evolution of

the framing approach because, in addition to the qualitative characteristics of the framing approach utilized and thoroughly investigated in previous studies, Tankard incorporated more quantitative elements into the framing approach by declaring that a news article's frame is not entirely determined by a single scholar's subjective analysis of it, but also by the presence of empirically verifiable characteristics (e.g., language and wording patterns) in that news article. In reviewing these major studies that utilized and expanded the framing approach to analyzing news media content in chronological order, one can easily see how the framing approach as grown and evolved since its origins (Entman, 1993; Gitlin, 1980; Tankard, 2001).

The application of media framing theory. Usually, the framing approach is utilized to analyze the news coverage of controversial issues in order to determine if these news stories are written in ways that are indirectly or directly bias and/or promote specific attitudes (such as positive attitudes or negative attitudes) towards the issues under consideration (Kuypers, 2002). Luther and Miller (2005) utilized the framing approach to study the 2003 news coverage of pro-war and anti-war demonstrations of the Iraq War. A content analysis of news articles about these demonstrations was conducted in order to compare the amount of stories that were framed from a perspective that *legitimized* the actions of the demonstrators to the amount of stories that were framed from a perspective that *delegitimized* the actions of the demonstrators (Luther & Miller, 2005). It was found that stories that covered "pro-war demonstrations" were more likely to be written from a "pro-war" frame, and stories that covered "anti-war demonstrations" were more likely to be written from an "anti-war" frame (Luther & Miller, 2005)

Kuypers (2002) also utilized a framing approach to study news media content. A thorough investigation of the news coverage of political events was conducted and it was discovered that journalists can frame news stories on political events from perspectives that are sympathetic to

(and can even directly align with) specific political positions (e.g., Democrat, Republican, liberal, conservative; Kuypers, 2002). This study, and others like it (that utilized the framing approach), have concluded with many interesting implications about how this practice of framing is connected to the public's understanding of many social issues and events (Kuypers, 2002; Luther & Miller, 2005). Kuypers (2002) concluded that rather than functioning as a vehicle for constructive criticism about issues and society, the news "media have evolved into a partisan collective which both consciously and unconsciously attempts to persuade the public to accept its interpretation of the world as true" (p. 12).

As can be seen, the framing approach to analyzing news media content has been utilized in different ways, has persistently offered valuable insight on the nature of bias in the news media, and can shine light on the complex nature of how news media content impacts the public's perception of reality. Now there will be an examination of relevant research on the news coverage of science that utilized a framing approach.

The Application of Framing to Study Science News and Differences Between Newspapers

Using framing to study science news. Many researchers have utilized the framing approach to study the news coverage of science. Usually, these studies investigate a *particular* controversial issue in the field of science in order to determine if news stories on controversial issues in science are framed in ways that endorse specific attitudes towards the issues under consideration (Friedman et al., 1999).

For example, Dirikx and Gelders (2010) utilized a framing approach to analyze the news coverage of the issue of climate change in Dutch and French news media. Framing was utilized

in order to compare the amount of news stories that identified climate change as a serious issue to the amount of news stories that identified climate change as an unimportant issue (Dirikx & Gelders, 2010). It was found that some articles were written from what was referred to as the "responsibility frame," where the issue was discussed with a sense of urgency and need for correction, but the majority of the articles were written from what was referred to as the "consequence frame," where the issue was discussed with an emphasis on the financial and temporal cost of the suggested correction efforts and other possible pursuits or non-pursuits were suggested (Dirikx & Gelders, 2010).

Liu, Vedlitz, and Alston (2008) conducted a content analysis of every article about the scientific issue of climate change that was published in the *Houston Chronicle* from 1992 to 2005 in order to compare the amount of news articles that framed the issue as a harmful problem to the amount of news articles that framed the issue as non-harmful. It was found that most of the articles did, in fact, frame the issue of global climate change as a harmful problem and that news media coverage of this issue increased over time.

Another example of the utilization of the framing approach to studying the news coverage of a specific controversial issue in science can be seen in Griffin and Dunwoody's (1997) study on the news coverage of pollution. Griffin and Dunwoody (1997) analyzed a number of news articles about environmental risks and pollution in order to compare the articles about this issue that were framed from a perspective that identified pollution as a serious, scientific issue that was worthy of correction efforts to the articles about this issue that were framed from a perspective that identified pollution as an unimportant, unscientific issue that was not worthy of correction efforts (Griffin & Dunwoody, 1997). It was found that newspapers in larger communities, rather than smaller communities, were more likely to address pollution as a scientific issue and that when pollution

was addressed as a scientific issue, it contained information about effects on public health and treated the issue more seriously (Griffin & Dunwoody, 1997).

Using framing to study differences between newspapers. Griffin and Dunwoody's (1997) study, and others like it, concluded with interesting implications about the connections between the news coverage of science and the public's support of scientific progress and pursuits (Dirikx & Gelders, 2010). For example, Griffin and Dunwoody (1997) found that some news articles were framed in a way that actually de-emphasized the important scientific information about the issue and placed the source of environmental problems outside of the readers' own community and beyond the public's control. This article also contained information on how the news coverage of pollution differed by region (i.e., whether the news company was located in a metropolitan city or in a smaller town); if the news article was written in a city, it was more likely to treat the scientific issues of pollution as a serious issue that was worthy of correction efforts (Griffin & Dunwoody, 1997).

Even though Husselbee and Elliott's (2002) study focused on the news coverage of hate crimes and not the news coverage of the field of science, this was a great example of a study that utilized framing theory in order to compare regional and national news coverage of controversial issues. Many similarities were found, but there were differences between the national newspaper coverage and the regional newspaper coverage of the same controversial issue (Husselbee & Elliott, 2002). One interesting finding about the news coverage of a particular hate crime that took place in Texas was that the national newspapers were more likely to frame the community in which the hate crime took place in an unfavorable light, whereas the regional newspapers (i.e., Texas newspapers) were less likely to present the community in which the hate crime took place in an unfavorable light (Husselbee & Elliott, 2002). This study and others like it have provided insight

into how to approach the study of the differences between the national news coverage and the regional news coverage of issues (Husselbee & Elliott, 2002).

Lacy, Fico, and Simon (1991) conducted a content analysis in order to investigate the differences between the news content in prestige newspapers and the news content in high-circulation papers. The subject of this study was fairness and balance and the content in nine prestige newspapers (including *The New York Times* and *The Washington Post*) and a number of high circulation newspapers (including *The Philadelphia Inquirer* and the Minneapolis *Star Tribune*) was content analyzed (Lacy et al., 1991). One interesting finding of Lacy et al.'s (1991) study was that prestige newspapers would present both sides of a controversial issue more often than high-circulation newspapers.

It is clear that the framing approach has been utilized by researchers to understand how news stories covering controversial issues in science are framed and how this impacts the public's understanding, awareness, and support of scientific progress and pursuits. Further, it has been shown that the framing approach has been used in order to investigate how news coverage of issues can be impacted by characteristics of newspaper companies (e.g., whether it is a high-circulation or a prestige newspaper). In this research project, a different framing approach will be utilized to study the news coverage of science. This approach builds off of the above-mentioned research, but is also unique because it takes a slightly different perspective.

Since the amount of scientific news coverage and the depth of scientific news have been thoroughly investigated, and since the framing approach has been used to study the news coverage of *specific* controversial issues in science, this thesis will contribute to this previous existing body of research on the news coverage of science by examining how current news articles on *all* (rather than just one) scientific issues are framed. This generalized approach will be utilized in order to

shine light on the way in which scientific inquiry, in general, is framed in terms of its tone (i.e., with a positive attitude towards the scientific issue under consideration or with a negative attitude towards the scientific issue under consideration) by prestige and high-circulation United States newspapers.

Research Questions

The research questions under investigation in this study are:

RQ 1: For each newspaper, what is the overall distribution of positively toned articles, negatively toned articles, and neutral/ambiguous articles about scientific subjects?

RQ 2: Do the prestige newspapers (i.e., *The New York Times* and *The Washington Post*) differ from the high-circulation papers (*The Philadelphia Inquirer* and the Minneapolis *Star Tribune*) in terms of their distributions of positively toned articles, negatively toned articles, and neutral/ambiguous articles about scientific subjects?

CHAPTER 3: METHOD

Content Analysis

This current study utilized the content analysis method of research. Content analysis can be understood as a systematic, quantitative, and objective gathering of data and measurement of variables (Wimmer & Dominick, 2011). The content analysis method can be utilized to describe communication content, to compare media content to the "real world," and to establish a starting point for studies of media effects (Wimmer & Dominick, 2011). Given that this study aimed to describe news coverage of the field of science in terms of how this may be connected to the public's understanding of science, content analysis was an appropriate method.

The Universe, Sample, and Unit under Study

The universe. Previous studies have declared that *The New York Times* and *The Washington Post* are two highly prestigious newspapers and that *The Philadelphia Inquirer* and the Minneapolis *Star Tribune* are two highly circulated newspapers (Husselbee & Elliott, 2002; Lacy et al., 1991; Pellechia, 1997). Because other previous research has indicated that the news media does have an impact on the public's perception of reality, then these prestigious and highly circulated newspapers made for a reliable universe of content from which to collect data for a study that investigated aspects of the American news coverage of an issue (Husselbee & Elliott, 2002; McCombs et al., 2011). For these reasons, the *universe* of content from which this study drew its sample was all of the science news content in these four United States newspapers: (a) *The New*

York Times, (b) *The Washington Post,* (c) *The Philadelphia Inquirer*, and (d) the Minneapolis *Star Tribune*.

The sample. Because this current study was not focused on a particular controversial issue or event in science, there was difficulty in deciding one specific time period for the sample. In order to assess the general nature of the news coverage of the particular scientific issue of climate change, Antilla (2005) analyzed one full year's worth of news coverage of the issue to make such a general assessment. Similarly, the sample for this study was drawn from one full year's worth of science news articles from *The New York Times, The Washington Post, The Philadelphia Inquirer,* and the Minneapolis *Star Tribune*. Using the LexisNexis Academic Search Engine, every news article in these four newspapers from January 1st, 2014, to December 31st, 2014, that had the word "science" in the headline or first paragraph of the article was gathered.

The unit. The individual *unit* of analysis in this study was the individual science news article. What was considered to be a "science news article" was any article that had the field (or a subfield) of science as its major theme and had the word "science" in the title or in the first paragraph of the article (i.e., see the introduction of this thesis for this study's definition of science news). These ranged from articles covering specific controversial issues in science (e.g., ocean pollution, the impact of technology on education, etc.) to articles covering issues related to the mere recognition of events in the field of science (e.g., astronomical events, Obama's appearance at a school science fair, etc.). Though these articles were quite diverse in how they were written and what they were written about, all of the news stories under consideration revolved around the major theme of the value of the field of science.

Now that the universe (i.e., *The New York Times, The Washington Post, The Philadelphia Inquirer,* and the Minneapolis *Star Tribune*), sample (i.e., a year's [2014] worth of science news

articles from these sources), and the unit (i.e., the individual science news article) of analysis in this study have been articulated and the reasons for choosing this universe, sample, and unit have been clarified, there will be an explication of how the units will be categorized and coded. Then there will be a discussion of what the findings of this content analysis may imply.

The Categories of Consideration

After examining the major research on the writing of science news, it can be inferred that, in addition to the general writing style of news articles (e.g., framing an issue as serious or not serious), the "frame" of a news story (i.e., the attitude towards an issue that is promoted in a news story) can be discovered by analyzing the tone (i.e., the use of positively or negatively phrased terminology) that was used *in* that news article (Bucchi 2013; Kuypers, 2002; Tankard, 2001). Previous studies have investigated the connections between the tone and the frame of a news article and these studies indicated that the tone of a news article is one dimension of that article's frame (e.g., some studies have even referred to "tone frames") (Bichard, 2006; McCombs et al., 2011). In general, articles can either be positive, negative, or neutral in tone (McCombs et al., 2011). Given that this study was interested in the general tone and attitude that is promoted towards scientific issues, these three general categories of tone identified by McCombs et al. (2011; i.e., positive, negative, and neutral) was utilized as the framing categories for this current study.

For each news story, coders read, carefully analyzed, and placed the news story into one of three categories: (a) positive, (b) negative, or (c) neutral/ambiguous. As in previous studies that utilized the framing approach to studying news media, the category that a news article belonged

to would be determined by identifying wording styles and patterns (e.g., positively or negatively phrased terminology) in the news articles (Tankard, 2001).

The first two (i.e., the "positive" category and the "negative" category) of the three categories were partially inspired by the work of previous researchers who studied the news coverage of controversial issues (i.e., the issue of pollution and the issue of climate change) in science from a framing perspective (Dirikx & Gelders, 2010; Griffin & Dunwoody, 1997). Even though the exact terminology (i.e., "positive" and "negative" categories) of this current study was not used in these previous studies, these researchers discovered that some news articles covering these controversial issues *were*, in fact, written from frames that this current study would consider to be "positive" and "negative" frames (Dirikx & Gelders, 2010; Griffin & Dunwoody, 1997).

As discussed above, rather than focusing on *one* controversial issue in science, this current study attempts to identify the amount of science news that was framed positively in comparison to the amount of science news that was framed negatively in news articles about *all* issues in science. Though the articles from the sample may be quite different from one another in terms of particular topic (e.g., an article about vaccines, an article about a lunar eclipse, etc.), one main element that determined whether a news article falls into the category of a "positively framed" news article or a "negatively framed" news article is whether or not the article framed the scientific event or issue as an *important* issue or as an *unimportant* issue.

The "positive" category consists of stories that were framed from a perspective that framed scientific issues with a sense of *importance* and encouraged scientific progress. Articles that were placed under the "positive" category were articles that were (a) written in a way that discussed the scientific issue with seriousness, (b) maintained a positive tone (i.e., contained an overall greater amount of positively phrased terminology than it did negatively phrased terminology) to describe

the work of scientists, (c) offered insight on how the general public can make positive contributions to the issue under consideration, or (d) any combination of these (a-c) (Tankard, 2001). The "positive" category of this current study was partially inspired by the "scientific" category of Griffin and Dunwoody's (1997) study on the news coverage of pollution.

Griffin and Dunwoody's (1997) study compared articles that framed pollution as a "scientific" issue (that is worthy of correction efforts from the general public) to articles that framed pollution as an "unscientific" issue. Based on the results of this study and others, it can be inferred that pollution is, in fact, a scientific issue (Griffin & Dunwoody, 1997; Haas, 2001). So, if the articles analyzed by Griffin and Dunwoody (1997) that framed pollution as a scientific issue were analyzed with this study's framework, then these articles would belong to the "positive" category.

The "negative" category consists of stories that were framed from a perspective that encouraged the abandonment of scientific enquiries (and/or other ideas contrary to the values of scientific investigation and progress). News articles that were placed in the "negative" category were articles that were (a) written in a way that discussed the scientific issue as an *unimportant* issue, (b) maintained a negative tone (i.e., contained an overall greater amount of negatively phrased terminology than it did positively phrased terminology), (c) encouraged the abandonment of scientific pursuits, or (d) any combination of these (a-c) (Tankard, 2001). The "negative" category of this current study closely resembles the "unscientific" category of Griffin and Dunwoody's (1997) study.

Recall Griffin and Dunwoody's (1997) study where articles that framed pollution as a "scientific" issue were compared to articles that framed pollution as an "unscientific" issue (that is not worthy of correction efforts from the general public). These "unscientific" articles of Griffin

and Dunwoody's (1997) study encouraged the abandonment of scientific pursuits and the cessation of attention to a particular scientific issue. So, if these "unscientific" news articles that were analyzed by Griffin and Dunwoody (1997) were analyzed with this current study's framework, then these articles would belong to the "negative" category.

In this current study, there is also a third "neutral" category, which consists of science articles that had elements from both (or neither) "positive" and "negative" frames. News articles that went under the neutral category were news stories that were (a) written from a perspective that was mixed and did not treat the subject with a sense of importance or a sense of unimportance, (b) maintained an overall descriptive (or ambiguous) tone (i.e., had a fairly even amount of positively and negatively phrased terminology), (c) offered a clear explication of the issue without encouraging a position towards the issue under consideration, or (d) any combination of these (a-c) (Tankard, 2001). This third category was constructed to avoid a restrictive, dualistic analysis and was inspired by the multiple categories utilized in Kuzyk, McCluskey, and Ross's (2005) content analysis of the news coverage of steel tariffs and in Dirikx and Gelders's (2010) content analysis of the news coverage of climate change.

In addition to "pro-tariff" news content and "anti-tariff" news content, Kuzyk et al.'s (2005) content analysis contained a third "neutral tariff" category in order to account for news articles that did not frame steel tariffs as good or bad, but rather maintained a descriptive tone about the tariffs. Similarly to Kuzyk et al.'s (2005) study, this current study contained a third "neutral/ambiguous" category in order to account for articles that do not belong in the "positive" or the "negative" categories.

In addition to the "consequence" frame (which this study would consider to be "negatively toned" science news) and the "responsibility" frame (which this study's framework would consider

to be "positively toned" science news), Dirikx and Gelders (2010) also utilized other categories (such as the "conflict" frame) in order to understand all news stories about this issue that may not belong in the two primary categories, but somewhere in between. Similarly, in addition to the "positive" category and the "negative" category, this study utilized a third "neutral" category in order to account for news articles that are ambiguous in tone or contain elements of both.

The final three categories defined. Succinctly, the "*positive*" category contains news stories that clearly framed the issue of the story with a sense of importance and used an overall greater amount of positively phrased terminology than they did negatively phrased terminology to describe the scientific issue of the story and/or work of scientists in that story. Also, the "*negative*" category contains news stories that clearly framed the issue of the story with a sense of unimportance and used an overall greater amount of negatively phrased terminology than they did positively phrased terminology to describe the scientific issue of the story and/or work of scientists in that story. Finally, the "*neutral*" category contains news stories that framed the issue of the story without a clear sense of importance or unimportance and used a *fairly* equal amount of positively and negatively phrased terminology and tone to describe the scientific issue of the story and/or work of scientists in that story. Now that the unit, sample, universe, and categories of this content analysis have been clearly explicated, there will be a discussion of the procedure of a pilot study that utilized this research method.

The Pilot Study and Coding for Full Study

Pilot test. In order to ensure that this research method would be reliable, an additional coder (i.e., in addition to the author) was trained and a pilot study was conducted with the

additional coder (Riffe, Lacy & Fico, 2005; Wimmer & Dominick, 2011). Before conducting the pilot study, the coder was provided with some general background information about science news, the study of science news, and how this current project approaches the study of science news from a different, more generalized perspective. Then the coder was given a copy of the code book and coding sheet in order to prepare for the pilot study. Refer to the appendix for the code book and coding sheet.

To complete the coder training process, a few science news articles that were not from the sample of the actual study (i.e., science news articles not from 2014) were analyzed (Neuendorf, 2002). Once the additional coder was trained and familiarized with the categories of the content analysis of this study, a small sample of science news articles (i.e., twelve science news articles that were not from 2014) was gathered using the LexisNexis Academic search engine for the pilot study.

The sample that was obtained for the pilot study consisted of twelve science news articles from *The New York Times, The Washington Post, The Philadelphia Inquirer,* and the Minneapolis *Star Tribune*. Rather than obtaining articles from the final sample (i.e., science news articles from these newspapers from 2014), the sample for the pilot study consisted of science news articles from these four newspapers from the year 2015.

After the twelve science news articles were individually examined by the author and the additional coder, the author met with the coder and the results were compared. Of the twelve examined articles there was only one article where the author and the additional coder did not agree on the tone of the article (i.e., the author believed that this article was neutral in tone and the additional coder believed that the article was negative in tone). The author held that there were

five positive articles, two neutral articles, and five negative articles and the additional coder held that there were five positive articles, one neutral article, and six negative articles.

The results indicated that an acceptable level of intercoder reliability was achieved from the first attempt at a pilot study. Using Holsti's formula, this pilot study resulted in a reliability coefficient of 92% and met the minimum of 90% that is required to achieve an acceptable level of intercoder reliability (Wimmer & Dominick, 2011). Using Scott's pi, this pilot study resulted in a reliability coefficient of .87 and met the minimum of .75 required to achieve an acceptable level of intercoder reliability (Riffe et al., 2005; Wimmer & Dominick, 2011).

Coding for full study. The author and the additional coder drew and analyzed exactly 50 random science news articles (i.e., 11.8%) from the final sample of the full study. Using Holsti's formula, the full study resulted with a reliability coefficient of 92% and met the minimum of 90% that is required to achieve an acceptable level of intercoder reliability (Wimmer & Dominick, 2011). Using Scott's pi, the full study resulted with a reliability coefficient of .86 and met the minimum of .75 that is required to achieve an acceptable level of intercoder reliability (Riffe et al., 2005; Wimmer & Dominick, 2011). Out of the 50 articles examined, the coders only disagreed on the tone of four science news articles.

CHAPTER 4: RESULTS

The results of the Lexis Nexis Academic search indicated that, in the year 2014, *The New York Times* had 956 science news articles, *The Washington Post* had 781 science news articles, *The Philadelphia Inquirer* had 174 science news articles, and the Minneapolis *Star Tribune* had 171 science news articles.   After eliminating the articles that were not pertinent (i.e., articles that contained the phrase "science" in the headline or leading paragraph but did not revolve around the theme of the field of, or a subfield of, science), it was found that, in the year 2014, *The New York Times* had 560 science news articles, *The Washington Post* had 424 science news articles, *The Philadelphia Inquirer* had 83 science news articles, and the Minneapolis *Star Tribune* had 96 science news articles.

In order to make the number of articles from both newspaper groups comparable, every fourth article was analyzed for the prestige papers (*The New York Times* and *The Washington Post*). Therefore, the final sample consisted of a total of 425 (N=425) science news articles. There were 246 science news articles from prestige newspapers (i.e., 140 from *The New York Times* and 106 from *The Washington Post*) and 179 science news articles from high-circulation newspapers (83 from *The Philadelphia Inquirer* and 96 from the Minneapolis *Star Tribune*).

Research Question One

The first research question of this study addressed the distribution of positively toned articles, negatively toned articles, and neutral/ambiguous science news articles for each

newspaper. Of the 140 science news articles from *The New York Times*, there were 57 (40.7%)

science news articles with a positive tone, 12 (8.6%) articles with a negative tone, and 71 (50.7%)

articles with a neutral/ambiguous tone. The 106 science news articles from *The Washington Post*

was made up of 44 (41.5%) science news articles with a positive tone, 17 (16%) articles with a

negative tone, and 45 (42.5%) articles with a neutral/ambiguous tone. Of the 83 science news

articles from the *Philadelphia Inquirer*, there were 44 (53%) articles with a positive tone, 13

(15.7%) articles with a negative tone, and 26 (31.3%) articles with a neutral/ambiguous tone. The

96 science news articles from the Minneapolis *Star Tribune* was made up of 45 (46.9%) articles

with a positive tone, 8 (8.3%) articles with a negative tone, and 43 (44.8%) articles with a neutral

tone. Table 1 contains the information that is pertinent to the first research question of this study.

Table 1

Distributions of Newspapers

	Positive	Negative	Neutral
The New York Times	57 (40.7%)	12 (8.6%)	71 (50.7%)
The Washington Post	44 (41.5%)	17 (16%)	45 (42.5%)
The Philadelphia Inquirer	44 (53%)	13 (15.7%)	26 (31.3%)
Star Tribune	45 (46.9%)	8 (8.3%)	43 (44.8%)

Chi-square (6, N=425) = 11.58, *p*= .072

About half (50.7%) of the science news articles in *The New York Times* had a

neutral/ambiguous tone, but 40.7% had a positive tone, and a small amount (8.6%) had a negative

tone. *The Washington Post* had an almost even amount of neutral/ambiguous (42.5%) and positive

(41.5%) science news and had a relatively small amount (16%) of negative science news. Slightly more than half (53%) of the science news articles in *The Philadelphia Inquirer* had a positive tone, but 31.3% had a neutral/ambiguous tone, and a relatively small amount (15.7%) had a negative tone. The Minneapolis *Star Tribune* had an almost even amount of positive science news (46.9%) and neutral/ambiguous science news (44.8%) and had a small amount (8.3%) of negative science news.

Research Question Two

The second research question of this study asked if there would be any differences between the prestige newspapers (i.e., *The New York Times* and *The Washington Post*) and the high-circulation papers (*The Philadelphia Inquirer* and the Minneapolis *Star Tribune*), in terms of their distributions of positively toned articles, negatively toned articles, and neutral/ambiguous articles about scientific subjects. Of the 246 science news articles from the prestige newspapers, there were 101 (41%) articles with a positive tone, 29 (11.8%) articles with a negative tone, and 116 (47.2%) articles with a neutral/ambiguous tone. The 179 science news articles from the high-circulation newspapers were made up of 89 (49.8%) articles with a positive tone, 21 (11.7%) articles with a negative tone, and 69 (38.5%) articles with a neutral/ambiguous tone.

Positive science news made up 49.8% of the science news content from the high-circulation newspapers (i.e., *The Philadelphia Inquirer* and the Minneapolis *Star Tribune*) and 41% of the science news content from the prestige newspapers (i.e., *The New York Times* and *The Washington Post*). Neutral/ambiguous science news made up 47.2% of the science news content of the prestige newspapers and 38.5% of the science news content of the high-circulation newspapers. There was

a relatively small percentage of negative science news content in both prestige newspapers (11.8%) and high-circulation newspapers (11.7%).

The prestige newspapers had more neutral/ambiguously toned science news than positively toned and negatively toned science news, and the high-circulation newspapers had more positively toned science news than neutral/ambiguously toned and negatively toned science news. One similarity is that the prestige newspapers and the high-circulation newspapers had more positive and neutral/ambiguous science news articles than negative science news articles. However, Pearson chi-square tests indicated that there was no statistically significant difference (chi-square [2, N=425] =3.50, p=.174) between the distributions of the high-circulation and prestige newspapers. Table 2 contains the information that is pertinent to the second research question of this study.

Table 2

Distributions of Newspaper Groups

	Positive	Negative	Neutral
Prestige Newspapers	101 (41%)	29 (11.8%)	116 (47.2%)
High-Circulation Newspapers	89 (49.8%)	21 (11.7%)	69 (38.5%)

Chi-square (2, N=425) = 3.50, p= .174

Additional Analyses

When the distributions of each of the four newspapers under investigation were identified (i.e., the answer to RQ1), some differences between the percentages of the four newspapers were

noticed. For instance, neutral science news made up 31.3% of the science news content of *The Philadelphia Inquirer* but made up 50.7% of the science news content of the science news content of *The New York Times*. Also, negative science news made up 8.3% of the science news content of the Minneapolis *Star Tribune* but made up 16% of the science news content of *The Washington Post.* While both 8.3% and 16% are both relatively small percentages, there is quite a difference because the percentage of negative science news in *The Washington Post* was almost double the percentage of negative science news in the *Star Tribune*.

Since these differences were observed, a statistical analysis was conducted to compare the distributions of each of the four newspapers. Pearson chi-square tests indicated that there was no statistically significant difference (chi-square [6, N=425] = 11.58, *p*= .072) between the distributions of the four newspapers under investigation.

When the distributions of the prestige and high-circulation newspapers were compared to each other (i.e., the answer to RQ2), some differences between the newspapers in each group were noticed. So comparisons between the newspapers *within* each group were also made. When the prestige newspapers (i.e., *The New York Times* and *The Washington Post*) were compared to one another, Pearson chi-square tests indicated that there was no statistically significant difference (chi-square [2, N=246] = 3.73, *p*=.155) between the distributions of the prestige newspapers (i.e., *The New York Times* and *The Washington Post*). When the high-circulation newspapers (i.e., *The Philadelphia Inquirer* and the Minneapolis *Star Tribune*) were compared to one another, Pearson chi-square tests indicated that there was no statistically significant difference (chi-square [2, N=179] = 4.47, *p*= .107) between the distributions of the high-circulation newspapers (i.e., *The Philadelphia Inquirer* and the Minneapolis *Star Tribune*).

CHAPTER 5: DISCUSSION

General Discoveries about the News Coverage of Science

The results of this study indicate that there was more positively and neutral/ambiguously framed science news than negatively framed science news among the groups and in all four individual newspapers. As noted above, 41% of the prestige science news was positive, 11.8% was negative, and 47.2% was neutral/ambiguous, and 49.8% of the high-circulation science news was positive, 11.7% was negative, and 38.5% was neutral/ambiguous. A slight majority (50.7%) of *The New York Times* science news content was neutral/ambiguous and 40.7% was positive. *The Washington Post* had an almost even amount of positive (41.5%) and neutral/ambiguous (42.5%) science news articles. The majority (53%) of *The Philadelphia Inquirer* science news was positive and 31.3% was neutral/ambiguous. The Minneapolis *Star Tribune* had an almost even amount of positive (46.9%) and neutral/ambiguous (44.8%) science news articles. There was a much smaller amount of negative science news articles in both groups (i.e., 11.8% of the prestige science news and 11.7% of the high-circulation science news) and in each of these four newspapers (i.e., 8.6% of the science news in *The New York Times,* 16% of the science news in *The Washington Post,* 15.7% of the science news in *The Philadelphia Inquirer,* and 8.3% of the science news in the Minneapolis *Star Tribune*).

Results Compared to Previous Science News Research

News coverage of climate change research. Boykoff (2007) studied the news media's coverage of climate change by conducting interviews and concluded that, when covering the issue of climate change, the news media has a greater focus on debates and disagreements than on coherent scientific explanations and that this has a negative impact on the public's understanding and appreciation of science. Boykoff (2007) concluded that, overall, the news media utilizes a negative tone to describe the issue of climate change. Even though no *direct* comparisons can be made to Boykoff's (2007) study, the current study's finding of more positive and neutral/ambiguous science news articles than negative stands in contrast to Boykoff's (2007) results.

One reason why this current study's findings differed from Boykoff's (2007) might be because Boykoff's (2007) study focused on the news coverage of climate change between 1995 and 2006, whereas this study dealt with the news coverage of science in 2014. In the time between 2006 and 2014 there was an increase in public support and awareness of the issue of climate change (Aspinall, 2010). This recent change in public opinion might explain why Boykoff's (2007) study of the news coverage of climate change between 1995 and 2006 found more negative science news and this current study of the news coverage of science in the year 2014 found more positive and neutral/ambiguous science news.

The amount of science news coverage in all four newspapers. One finding of this study that is worthy of mention was that there was a large amount of science news in these four newspapers (e.g., *The New York Times* search originally resulted with 560 science news articles from the year 2014 and *The Washington Post* search originally resulted with 424 science news

articles from the year 2014). Pellechia (1997) analyzed every science news article that was in *The Chicago Tribune, The New York Times,* and *The Washington Post* over the span of thirty years (i.e., from three time periods: 1966 to 1970, 1976 to 1980, and 1986 to 1990) in order to determine if the amount of science news coverage changed, in comparison to other news. Pellechia (1997) found that, over the span of the three decades under investigation, the amount of science news coverage gradually increased.

Like Pellechia's (1997) study on the amount of science news, this current study resulted with the general observation that there was, in fact, a great amount of United States news coverage dedicated to the field and subfields of science. However, this current study had a different structure than Pellechia's (1997) study that examined the amount of science news, so no direct comparisons can be made between this current study and Pellechia's (1997) study. This current study analyzed one year's worth of science news and did not compare the amount of science news to the amount of other news.

Further, there was a major difference between the amount of science news articles in the prestige papers (i.e., an original total of 984 science news articles) and in the high-circulation papers (i.e., a total of 179 science news articles). This might be explained by differences between prestige and high-circulation newspapers: prestige newspapers have access to a greater amount of qualified sources and prestige newspapers have access to more financial resources (Carpenter, 2007). For these reasons, prestige newspapers have a greater amount of news coverage and are considered to have higher quality content (Carpenter, 2007). It could be inferred that prestige newspapers had a greater amount of science news content because prestige newspapers had access to a greater amount of resources (Carpenter, 2007).

Even though neutral/ambiguous was the leading category for the prestige newspapers and positive science news was the leading category for the high-circulation newspapers, there was not a great deal of difference in the way science was covered in prestige newspapers and high-circulation newspapers. This could be explained by the fact that, regardless of their organizational affiliation, science news journalists strive for the common goal of objectivity (Dunwoody, 1997; Shoemaker & Reese, 2014).

Previous studies have indicated that science news journalists, regardless of their organizational affiliation, seem to maintain a sense of cooperation, have many commonalities at the routine level, and strive for fairness, balance, and accuracy in their reporting (Dunwoody, 1997; Shoemaker & Reese, 2014). This could explain why this current study found no statistically significant difference between the tone of science news in prestige and high-circulation newspapers or between the tone of science news in the four newspapers.

These results indicate that prestige newspapers cover scientific issues with more frequency than high-circulation newspapers, but the results also indicate that science is framed quite similarly in prestige and high-circulation newspapers. This means that regardless of organizational differences (i.e., the factors that caused prestige newspapers to have a considerably larger amount of science news that high-circulation papers), science news writers seem to share a common set of routines and norms (Shoemaker & Reese, 2014). In particular, it seems that science news writers strive for the norm of objectivity, regardless of the organization they are affiliated with (Dunwoody 1997; Shoemaker & Reese, 2014).

Previous studies that compared newspaper types. Lacy et al. (1991) studied differences between how controversial issues were framed in prestige and high-circulation papers and found that prestige newspapers were more likely to present both sides of a controversial issue than high-

circulation newspapers. Contrary to Lacy et al.'s (1991) findings, this current study found no results of statistical significance when comparing the distributions of the prestige and the high-circulation newspapers.

It is possible that the reason why there are differences between the results of Lacy et al.'s (1991) study on the differences between prestige and high-circulation newspapers and this current study on the difference between prestige and high-circulation newspapers might be because Lacy et al. were focused on controversial issues and this current study was focused on the news coverage of issues in science. However, the fact that Lacy et al. (1991) dealt with multiple controversial issues (similarly to how this current study dealt with multiple issues in science) rather than studying one particular issue gave good reason to believe that the results of both studies would have been more similar.

This difference between the findings of this current study and the findings of Lacy et al.'s (1991) study could be explained by the fact that, in addition to *The New York Times, The Washington Post, The Philadelphia Inquirer,* and the Minneapolis *Star Tribune* (i.e., the only four newspapers that were investigated in this current investigation), Lacy et al. (1991) investigated a larger amount of newspapers (e.g., *The Milwaukee Journal*, the *St. Louis Post-Dispatch,* the *Los Angeles Times*, and others). If this current study, like Lacy et al.'s (1991) study, utilized a larger amount of newspapers, then it is possible that the results of this current study would have been more similar to the results of Lacy et al.'s (1991) study. Further, the fact that this current study only examined every fourth article of the prestige newspapers might explain why the findings of this current study were different from the findings of Lacy et al.'s (1991) study.

The observation of this current study that prestige newspapers had a greater amount of science news articles than high-circulation newspapers is consistent with Lacy et al.'s (1991)

findings because Lacy et al. found that prestige newspapers would cover issues with more depth than high-circulation newspapers. Further, the finding of this current study that the neutral/ambiguous frame was more present in prestige newspapers than in high-circulation newspapers was also consistent with the findings of Lacy et al.'s (1991) study. This is one way in which this current project has expanded previous research on the differences between prestige and high-circulation United States newspapers.

Carpenter's (2007) investigation of the news coverage of the 2003 U.S. invasion of Iraq concluded with the discovery of significant differences between the news content in prestige newspapers and the news content in non-prestige newspapers. Carpenter (2007) found that prestige newspapers contained a greater amount of qualified sources than high-circulation newspapers and that high-circulation newspapers focused less on conflict and focus more on the "human interest" elements of war. Even though Carpenter (2007) was not dealing with the news coverage of science, Carpenter's findings should give one reason to believe that this current study, which also focused on the differences between prestige (i.e., elite) and high-circulation (i.e., non-elite) newspaper content, would also conclude with the discovery of significant differences between prestige and high-circulation newspaper content. Contrary to Carpenter's (2007) findings, however, this study did not conclude with the discovery of any significant differences between the news content in prestige and high-circulation newspapers.

This lack of agreement between Carpenter's (2007) findings and the findings of this current investigation might be explained by the fact that Carpenter was not only dealing with a different issue (i.e., the news coverage of the Iraq War, rather than the news coverage of science) but was also focusing on the sources cited in the articles, rather than the general tone of the articles.

However, the sources cited in an article and the tone of an article are actually closely related; the sources that are used to create an article can have a significant impact on the tone of the article.

Previous studies that examined science news and newspaper types. Evans, Krippendorf, Yoon, Posluszny, and Thomas (1990) conducted a content analysis of 185 science news articles in prestige newspapers and 106 science news articles from non-prestige newspapers. Evans et al. (1990) discovered that, when considering the amount of science news *and* the tone of science news, there was no significant difference between how prestige and high-circulation newspapers covered scientific issues. Similar to Evans et al.'s (1990) investigation, the results of this current investigation indicated that there was not a great deal of difference between how science was covered in prestige and high-circulation newspapers.

Even though Evans et al. (1990) obtained 185 prestige science news articles and 106 non-prestige science news articles (i.e., the amount of prestige science news was almost *double* the amount of high-circulation science news), the results of this current study indicated that there was a *vast* difference (i.e., the amount of prestige science news was more than *five times* the amount of high-circulation science news) between the amount of science news content in prestige and high-circulation newspapers. In fact, this current study's most interesting finding was that there was such a drastic difference between the amounts of science news in prestige (i.e., 984 articles) and high-circulation newspapers (i.e., 179 articles).

Key Findings

Even though no results of statistical significance were found when comparing the distributions of the prestige and the high-circulation newspapers and no results of statistical

significance were found when comparing the newspapers within these groups, some noteworthy comparisons between the distributions of the prestige and the high-circulation newspapers were made. One similarity is that both the prestige newspapers and the high-circulation papers had a relatively small amount of negative science news: negative science news made up 11.8% of the prestige newspaper content and 11.7% of the high-circulation newspaper content.

As mentioned, this observation can lead to many new questions. Regardless of these new questions, it is fair to say that both prestige newspapers and high-circulation papers had a relatively small amount of negative science news. One could argue that positive science news is preferable to neutral/ambiguous science news because the reader of a positive science news article would feel more inspired about the topic of the article and the reader of a neutral/ambiguous science news article would feel more indifferent about the topic of the article (Boykoff, 2007; Evans et al., 1990). This argument would entail the idea that the news coverage of science should be framed positively because this would promote an environment where the public awareness, support, and understanding of science would be increased and that this cooperative environment would be beneficial to our world (Boykoff, 2007; Dunwoody, 1997; Evans et al., 1990). However, the author holds that even though this objection might be true, both positive science news articles and neutral/ambiguous science news articles are preferable to negative science news articles because subfields, or the field, of science are not antagonized in positive or neutral/ambiguous science news articles.

One could argue that, due to the large amount of science news in the prestige newspapers, the prestige newspapers presented scientific issues with a greater sense of newsworthiness than high-circulation newspapers. This line of reasoning would entail the assumption that the amount of news coverage of an issue can serve as an indicator of the newsworthiness of that issue. At the

very least, the findings of this study indicated that prestige newspapers do pay more attention to scientific issues than high-circulation newspapers.

Limitations and Future Research

One potential challenge to this study was that only newspapers were analyzed and that, in recent years, there has been an increase in the amount of people who obtain news from the internet and other electronic sources, rather than newspapers. However, newspapers were analyzed because these were available in the LexisNexis Academic database and made for a consistent (and replicable) sample that served its purposes for the current study.

Another potential challenge to this study is related to the database search terms. It is possible that there were pertinent science news articles in these newspapers that did not contain the word "science" in the title or leading paragraph of the article (e.g., an article may have been about "physics" rather than "science"). Also, it is possible that the search terms prevented articles about the social sciences (e.g., an article may have been about "psychology" rather than "science") from being obtained. However, this sample contained a fairly large amount of articles, had a fairly even mix of hard science and social science news articles, and made for a reliable sample for the current study.

One limitation of this study was that only every fourth article of the prestige newspaper search results was analyzed. Even though the reasons for choosing this research method have been justified, it is worthy of mention that 75% of the initial prestige newspaper content was not analyzed and that this may have had an impact on the results of the study. Even with this limitation,

this study still served its purpose of analyzing the news coverage of science from a different, more generalized perspective.

Another limitation of this study was the sample size. Only four newspapers and only one full year's worth of science news were analyzed. The results of this study would be more definitive if this study were replicated with a larger sample that consists of a greater amount of newspapers (i.e., from different regions and different levels of prestige) and a longer time frame (e.g., perhaps, 3 or more years). Even though the results of this current study are not generalizable, the sample size of the current study was large enough to provide *some* insight into the way in which science is covered by the United States news media and served the purposes of the current study.

One question that should be addressed in future research is the issue of differences between the news coverage of particular scientific issues. The whole purpose of this current study was to approach the study of science news from a more generalized perspective, but if future studies that deal with the general nature of science news pay closer observation to the particular scientific issues, then even more knowledge about the news coverage of science could be obtained. Not only should the general class of science (i.e., social science or hard science) be recorded but also the specific type of science (e.g., psychology, biology) and the specific scientific issue (e.g., climate change, pollution).

As mentioned above, another question that should receive further investigation in future science news research is the issue of geography or region. If this current study were replicated with a greater amount of newspapers from a wider variety of regions of the United States, then new discoveries about how the news coverage of science differs by region could be gained. Further, if this study were replicated on an international scale using newspapers from the United

States and other countries (e.g., United Kingdom, Japan), then discoveries about how the news coverage of science differs by country could be made.

Another issue that should be addressed in future science news research is the issue of the newspaper types (e.g., level of prestige, special-interest newspapers). If this study were replicated with a wider variety of kinds of newspapers (i.e., not only with prestige and high-circulation papers but also with local newspapers, newspapers that specialize in scientific issues, and more), then new findings about the news coverage of science could be gained.

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CODEBOOK

Introduction

This content analysis will examine the United States news coverage of the field of science. There will be a comparison of science news articles that had positive, negative, and ambiguous/neutral tones, in order to determine the general attitude towards the field of science that is promoted by the United States news media.

Coding Instructions

Carefully read each news story and mark if the story was in a high circulation or in a prestige newspaper. Then, determine whether the story was written with a positive tone, a negative tone, or the neutral/ambiguous tone. For some articles, it may be difficult to determine from which frame the article was written. However, select the frame that is most prominent in the article. Also, the title of a news story and the first paragraph of a news story can help one determine from which frame that news story was written.

Newspaper Types

- **Prestige Newspapers** – The prestige newspapers under investigation in this study are *The New York Times* and *The Washington Post.*

- **High Circulation Newspapers** – The high circulation newspapers under investigation in this study are *The Philadelphia Inquirer* and the *Star Tribune*.

Framing Categories

- **Positive -** the "positive" category will contain news stories that clearly frame the issue of the story with a sense of importance and use an overall greater amount of positively phrased

terminology than they do negatively phrased terminology to describe the scientific issue of the story and/or work of scientists in that story.

- **Negative -** the "negative" category will contain news stories that clearly frame the issue of the story with a sense of unimportance and use an overall greater amount of negatively phrased terminology than they do positively phrased terminology to describe the scientific issue of the story and/or work of scientists in that story.

- **Neutral/Ambiguous -** the "neutral/ambiguous" category will contain news stories that frame the issue of the story without a clear sense of importance or unimportance, and use a *fairly* equal amount of positively and negatively phrased terminology to describe the scientific issue of the story and/or work of scientists in that story.

Coding Sheet

Story # _____.

Newspaper _____.

Newspaper type (prestige or high circulation)_____.

Story Date (month and day) _____.

Clear Explication of Framing Category (mark only one)

      Positive News Article_____.

      Negative News Article _____.

      Neutral/Ambiguous News Article _____.