Introducing Technical Communication through Science Fiction: A First-Year Seminar

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Abstract – First-year seminars allow freshmen to adjust to university life and the scope of academic options available to them. Additionally, they provide a foundation for future college success by exposing students to the requirements of a specific discipline in an engaging, small-group setting. This paper describes a first-year seminar that introduces the principles of clear, ethical technical communication by exploring the history of science fiction movies, which often represent the ignorance and fear of a public subjected to misleading information. The goals of the course are to help engineering students develop the communication skills needed in their future coursework, learn to be discerning consumers of information, and understand the ethical responsibilities of experts. Future course modifications focus on reaching more students and ensuring the relevance of assignments.

Keywords: first-year seminar, science fiction, technical communication

THE VALUE OF FIRST-YEAR SEMINARS

First-year seminars are commonly used to increase persistence and retention of college freshmen. While seminar programs vary widely in focus and effectiveness, the chance of seminar participants returning for a second year of college is, on average, 5–15% higher than for non-participants [Goodman, 3]. The most successful seminar programs offer meaningful interactions with faculty and introduce intriguing topics of study. Particularly significant for future academic success, students who have taken a seminar report more positive perceptions of themselves as learners [3]. Subject-specific seminars have the added benefit of giving students a realistic view of the curriculum demands of their majors and equipping them with the tools to meet some of those demands. Mississippi State University (MSU) invites faculty to teach a course on a topic that is both educational and interesting. All incoming freshmen are invited to take "one for fun," a slogan that illustrates the emphasis on students' freedom to choose a one-hour course for the pure enjoyment of learning something new. Instructors are encouraged to create an active-learning environment so students are engaged and motivated to apply what they learn to other courses.

PROGRAM AND COURSE BACKGROUND

The Shackouls Technical Communication Program (TCP) is a unit of the Bagley College of Engineering (BCoE). Developed in 1999, its main function is designing and administering the course GE 3513 Technical Writing, which is a communication course required of all junior and senior engineering students. Based on coordination with the eight engineering departments in the BCoE, the course is designed as a practical complement to the students' upper-level coursework by allowing them to choose writing and speaking topics in their field, even specific to their research interests. Additionally, the assignments reflect the types of documents and presentations that students typically encounter in their coursework as well as their careers. A challenge of teaching Technical Writing is battling two misconceptions, which can become deeply engrained by the junior year: 1) communication instruction is not applicable to technical fields and 2) engineers are poor writers who will not be able to improve. A primary reason for the first misconception is that many students enter the course with little writing instruction beyond the essay assignments in English Composition I and II, which often do not reflect the demands of engineering coursework. The second misconception can result from a lack of awareness that any writer, regardless of natural

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ability, only improves through the process of writing, receiving and analyzing feedback, and rewriting. In other words, successful communication is a habit that must be practiced rather than an aptitude that either exists or does not. In an attempt to foster this habit early by introducing the tenets of effective technical communication, the freshman seminar GE 1001 Ignorance is NOT Bliss was added to the Shackouls TCP in 2010. The ultimate goal of the course is to enable engineering students to identify strategies and develop habits they will then incorporate into all of their communication assignments.

Enticing most engineering students to elect to take a writing and speaking course "for fun" is not an easy task. Explaining the practical value of the instruction is effective only after students are actually enrolled and attending the course, so a strategy was needed to make the course appealing as well as practical. Science fiction movies offer both a natural connection between communication and science/technology and an intriguing angle to use in advertising the seminar. Social attitudes can be traced through the movie themes that have been popular at different times in history. Therefore, science fiction movies, particularly those with dystopian themes, tend to portray the public's fears about science and technology in a given era. This is also true of science fiction literature, but most students would prefer to watch movie clips rather than read passages from novels. With movies, short clips can also elicit intense responses, making them ideal for engaging student discussion among freshmen who may feel hesitant to join class discussion in large survey courses. This discussion can easily lead to an examination of the social context of particular movies. Excerpts from publications and speeches of a given era help tell the story of the public's attitude about the movie's subject. Students begin to see the connection between the way experts and politicians explain topics to the public and the public's fears of these topics. The focus then shifts to communication and ethics, which are now more interesting against the backdrop of the movies.

COURSE STRUCTURE

Table 1 shows the topics covered and assignments due each week.

Table 1. GE 1001 Semester Schedule

Week	Class Discussion	Homework
1	Introduction to course; student questionnaire	Choose a sci-fi movie and be prepared to discuss how it shows society's views of a science or technology topic.
2	Frankenstein and Galvanism; responsible research methods; finding and evaluating credible sources; clips of Frankenstein (1931)	Read "A Historical View of Scare Tactics" and be prepared to discuss how scientists helped shape public perception during the atomic age.
3	Fear and confusion during the atomic age; clips of the movie *Them!* (1954)	Find an example of a well-written article on a topic in your field and bring a copy to class. Be ready to explain why this article appealed to you.
4	Continuing the atomic age; clips of *Night of the Living Dead* (1968)	Find an article about a controversial topic in your field and bring a copy to class. Be ready to discuss whether the article offered a credible, objective view of the topic.
5	The space race, the Cold War, and Martians; early 20th century misconceptions about Mars; clips of *Invasion of the Body Snatchers* (1956)	Major Assignment: Write a formal analysis of an article related to your field (can be one of the articles already submitted for homework or a new one).
6	Zombies as representations of pandemic fears; clips of *I am Legend* (2007) and *28 Days Later* (2002)	Read the packet of introductions to articles on science and technology and decide which is most effective; be ready to discuss your choice and reasons.
7	Strategies for interesting and effective technical descriptions	Complete the exercise on concise, focused writing and bring it to class.

8	Guidelines for clear, concise technical writing	Choose one lecture to evaluate this week for presentation skills; fill out the Presentation Evaluation Form and bring to class. Choose a topic for your research paper and presentation and email me your topic selection.
9	Strategies for effective presentation delivery; view clips of successful presentations of scientific/technical material	Print and bring to class at least two sources for your research paper/presentation.
10	Effective use of visuals and slide shows to explain scientific/technical material	Print and bring to class at least two additional sources for your research paper/presentation; compose at least five presentation slides for in-class review
11	In-class slide review for presentation	Bring a rough draft of your research paper (at least two pages) to class for an in-class workshop.
12	In-class rough draft workshop for research paper	Major Assignment: Be prepared to deliver your presentation on your scheduled date.
13	Student presentations given in class	Major Assignment: Research paper is due next week.
14	Student presentations, continued	Research paper is due today in class.

SCIENCE FICTION TOPICS

The first six class meetings consist of a survey of popular science fiction topics in different periods with an emphasis on the fears they represent. Class time is spent discussing the social context of the week's topic, viewing clips of representative movies, and making connections with current topics.

Prometheus and Victor Frankenstein

The Prometheus of Greek mythology was a tragic link between humanity and the heavens. After shaping humans from clay and defying the gods by stealing fire for them, he was condemned to eternal suffering. By 'playing god,' Prometheus became a symbol of the danger of equipping humans with abilities they lack the right to claim and the sense to use wisely. *Mary Shelley's Frankenstein; or the Modern Prometheus* (1818) continues this symbolism by depicting the driven scientist, Victor Frankenstein, and his relentless quest to create life from death. Frankenstein is tortured after he sees "the demoniacal corpse to which [he] had so miserably given life" [Shelley, 11]. The subject of science overreaching and its consequences was relevant to Shelley because the scientific inspiration of the novel, galvanism, was a source of curiosity and fear in eighteenth-century England. Galvanism, named for Italian physicist Luigi Galvani, is the contraction of muscle through electric current. Galvanism experiments involving animals and even newly hanged prisoners revealed its enormous scientific promise and horrific potential applications [James, 6]. Through the novel and clips of the 1931 *Frankenstein* film, students are introduced to a connection between actual science and a science fiction treatment, the implication that public perception of science is often shaped by incomplete information, and the symbol of the scientist too consumed by ambition to consider the ethical consequences of innovation. Students are asked to consider current fields that represent a risk of overreaching or topics that tend to confuse and frighten the public. Popular responses include genetic engineering, artificial intelligence, and surveillance technology.

The Atomic Age

Just as Frankenstein's monster is not inherently evil but made so by human misuse after its creation, the ethics of any technology depend on its application, sometimes leading to consequences unintended by developers. Nuclear technology illustrates this complex relationship between developers and decision makers and reveals how the relationship affects public understanding. From the first successful detonation of an atomic bomb, the Trinity Test, on July 16, 1945 to its use as a World War II weapon one month later, the world's awareness of and reaction to nuclear weapons has undergone many changes, reflecting the changing political climate. From 1945 to the early

1960s, Americans were increasingly aware of the potential of nuclear weapons, both as protection and as a constant threat from the Soviet Union. Politicized scientific explanations of nuclear technology added to the concern and confusion. To illustrate the effects of this communication, students are asked to read "A Historical View of Scare Tactics," which explains 1940s scientists' attempts to manipulate the American public's political attitudes through fear: "The frightening speeches, articles, and radio broadcasts invariably ended with a call for support of what activists believed to be the only alternative to the nightmarish destruction of mankind: the international control of atomic energy" [Boyer, 1]. Ironically, these activist scientists' strategy had the opposite effect, as their "endless insistence on the terrifying destruction of the bomb had left the American people 'half educated:' the lesson of the bomb's power had been learned; the lesson that diplomacy offered the best means of escaping the terror had not, leaving a net effect of despair and confusion" [1]. To illustrate the climate of the time and the effects of confusing communication, students are shown the 1951 *Duck and Cover* civil defense film and clips of the movie *Them!* (1954), which imagines that radiated ants from atomic testing are waging war against humans. Students are then asked to consider current scientific issues that are often politicized. The two most common responses are climate change and vaccination safety. Class discussion then focuses on how conflicting, biased messages affect public understanding. The ethical obligation of experts to provide clear, objective information is a final point of discussion.

The Cold War and the Space Race

While the U.S. and the Soviet Union were engaged in an arms race, they were aggressively pursuing competing space programs. Dominance in space would indicate technological, military, and political superiority. The Soviet Union's successful Sputnik launch in 1957 prompted fear and increased determination in the U.S., with President Kennedy proclaiming that the U.S. would become the first nation to put a man on the moon by the end of the 1960s. As U.S.-Soviet tension grew, communism came to be seen as an insidious threat to American life, more subtle than a military attack but equally dangerous. To guard against the spread of communism, the House Un-American Activities committee and Senator Joseph McCarthy began holding hearings in the late 1940s to determine the source and extent of the subversion. As people began to testify against one another, lose their jobs, and face prosecution, paranoia increased [Hyndershot, 5]. Students watch clips of a government propaganda film typical of the era, *Red Nightmare* (1962). The main character wakes to find that communism has overtaken society, including his family, who now seem brainwashed and emotionless. Class discussion then shifts to how these themes appeared in science fiction movies of the time. *Invasion of the Body Snatchers* (1956), based on Jack Finney's 1955 novel, portrays a small-town doctor who gradually realizes that townspeople are being replaced by alien 'pod people.' The 'pod people' look the same as before but are now cold and soulless, and the doctor is helpless to prevent the spread of this alien takeover. Although the author and filmmakers denied an attempt at political commentary, the similarities between the portrayals of invasions are striking, and 1950s audiences would have viewed the film through the tensions of the era [Vizzini, 12]. As a point of discussion, students are asked to consider the close relationship between social attitudes, politics, and views of science. Previous weeks' discussion topics, such as genetic engineering and climate change are revisited, but this time students are asked whether it is possible to separate cultural, social, and political views from these topics.

Pandemics and Zombies

While the zombie motif is a current trend in graphic novels, television shows, and movies, the concept of the living dead originated in 18th century Haiti, where slaves were taught that a life of servitude was preferable to suicide, which would cause their souls to linger in eternal agony [McAlister, 8]. The reason for the return from death has changed over time, reflecting social context. In George Romero's *Night of the Living Dead* (1968), radiation from a fallen satellite spread through the ground to animate the buried dead. The current portrayal of a zombie virus (*28 Days Later*, *The Walking Dead*) illustrates real fears of pandemics. In fact, the spread of the zombie infection and the necessary government response is so similar to actual catastrophes that the zombie apocalypse has been used as an emergency training exercise [Fuentes, 2]. The CDC's manual for the zombie apocalypse "Preparedness 101: Zombie Pandemic" is part entertainment, part realistic guide for proper general emergency preparation ["Zombie Preparedness," 13]. Because of the current popularity of the zombie subgenre in TV, comic books, and video games, students are fascinated with the real fears behind the phenomena.

To establish a connection to science, the class discusses the following excerpt of David Quammen's "Where Will the Next Pandemic Come from? And How Can we Stop It?" [10]:

> Over the last half dozen years, I have asked eminent disease scientists and public-health officials, including some of the world's experts on Ebola, on SARS, on bat-borne viruses, on HIV-1 and HIV-2, and on viral evolution, the same two-part question: 1) Will a new disease emerge, in the near future, sufficiently virulent and transmissible to cause a pandemic capable of killing tens of millions of people? and 2) If so, what does it look like and from where does it come? Their answers to the first part have ranged from maybe to probably. Their answers to the second have focused on zoonoses, particularly RNA viruses. The prospect of a new viral pandemic, for these sober professionals, looms large. They talk about it; they think about it; they make contingency plans against it: the Next Big One. They say it might happen anytime.

Quammen's description of pandemics' real sources sounds like the plot of a horror movie, so the public's general fear of exotic-sounding viruses is understandable. Students are asked to consider how experts should inform the public of proper steps to take regarding health concerns without inducing panic. The CDC's use of twitter to combat the misleading messages during the early days of the H1N1 outbreak is one example of a practical method of communicating responsible information to the public ["How Social Media…" 4].

ASSIGNMENTS

Because MSU's freshmen seminars offer only one hour of course credit toward graduation, instructors must assign meaningful work that reinforces the concepts presented in class without making unrealistic demands of students' time. The following are GE 1001's major assignments and their respective weights:

1. One formal analysis of technical writing – individual assignment (a one-page analysis of a current article (published within the past two years) about science or technology (25%)
2. One 3–4-page research paper on current topic related to science or technology (30%)
3. One 4–6-minute presentation of the research paper's topic (30%)
4. Numerous in-class exercises, homework assignments, and class discussions (15%)

The first assignment, the analysis of a technical article, is intended to introduce the importance of evaluating a source's credibility. Class time is spent demonstrating proper use electronic resources. Students are given a list of periodical index and reference databases commonly used in science and engineering. An exercise in database use involves students suggesting areas of interest, with the class helping determine search parameters and investigating the different sources returned when restricting searches to full-text, scholarly publications, and date of publication. Class discussion also focuses on responsible use of Internet sources, as students are introduced to the criteria used to discern reputable information: point of view, authority, reliability, timeliness, scope, and repeatability [McMurrey, 9].

In fall 2012, student article analysis topics included computer sketch recognition, the use of military drones, and wind turbine design. Many students applied their interest in and knowledge of science and technology to their analyses. In excerpt A, a student imagines a possible application for computer sketch recognition.

Excerpt A–Practical Applications of Technology

> Not only do I foresee those who are handicapped benefitting from this [technology], but I can also see where this could enhance people's ability to search for things online. Currently, we are limited to searching for topics on the internet by simply spelling them into a search engine. Users who can remember what something looks like but can't remember what it was called could try to draw the item.

This student is moving beyond the article's content and imagining design implications, an important skill for engineering students who will one day design products with specific user needs in mind.

Excerpt B offers a clear, concise summary of a research article on wind turbine output.

Excerpt B–Summary of Technical Information

> The most important variable when dealing with wind is the terrain where the field of machines is placed. Therefore, it was important to study machines on the same farm so the terrain would be the same for each machine. The age of the machine also plays a major role in how much power will be generated, which is why the engineers used the same age of machines to collect data. The three machines that were chosen for this experiment were 30 meters, 40 meters, and 50 meters in height [1].
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> [1] N. Murugan and M. Umamaheswari. "Experimental Investigation on Power Output in Aged Wind Turbines," *Hindawi Publishing Corporation: Advances in Mechanical Engineering*, October 12, 2012. Available: http://www.hindawi.com/journals/ame/2012/380986/

This response demonstrates effective summary skills as well as an understanding of the research process, including variables and controls. The act of writing about this research should reinforce the student's understanding of research in general. The same student's analysis of the wind turbine article reveals an understanding of the importance of considering the audience (Excerpt C).

Excerpt C–Audience Analysis

> Even though the article was very technical, the writer did explain each step to an extent that any reader can understand the main objective. For example, the author clearly explained the terrain features such as elevation that impact the amount of wind that travels through that part of the land.

The second and third assignments (research paper and presentation) are based on the same topic to reduce the time commitment and the amount of research required. Students are also allowed to use the same topic as the article analysis, which means they already have one of the five required sources. To prepare for these projects, weekly homework assignments and in-class exercises focus on analyzing effective communication. For one homework assignment, students are asked to find articles they feel represent clear writing in their field and bring them to class. The class is then broken into groups of three or four students, who swap articles and discuss the strategies in the articles that they find particularly successful. At the end of the exercise, each group presents to the class specific strategies in their articles and common strategies are identified. These examples are used to illustrate Mike Markel's Measures of Excellence in Technical Writing: honesty, clarity, accuracy, comprehensiveness, accessibility, conciseness, professional appearance, and correctness [7]. To prepare for the presentation, students view clips of technical presentations from the Technology, Entertainment, Design (TED) annual conferences, also known as TED Talks. As with the writing samples, students are asked to identify aspects of content, delivery, and visual presentation that appeal to them. Through these responses, effective strategies are discussed.

In fall 2012, students chose research paper/presentation topics such as stem cell research, genetically modified crops, and artificial intelligence. A student paper on stem cell research summarizes ethical implications, demonstrating an objective handling of a complex topic (Excerpt D).

Excerpt D–Handling Controversy

> Stem cell research, however controversial it may be, could hold the key to curing many life-threatening diseases. In the future, stem cell research might lead to endless medical opportunities. For many opponents, though, "the moral cost of continuing such research outweighs any potential benefit" [4].
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> [4] Reaves, Jessica. "The Great Debate over Stem Cell Research," *Time Magazine Online*, July 11, 2001. http://www.time.com/time/nation/article/0,8599,167245,00.html

In Excerpt E, a student begins describing the typical operation of a nuclear power plant in a way that is concise and clear for a non-expert.

Excerpt E–Technical Description

> The first component is fuel in the form of uranium. Fuel rods are formed with these uranium oxide pellets and arranged in the reactor core. During fission the neutrons are producing very high energy, meaning they are moving very fast. The moderator, generally water, located in the core, decreases the speed of the neutrons in order to make the chain reaction efficient. By doing this, fission is even greater [3].
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> [3] "Nuclear Power Plants," *EPA*, October 17, 2012, http://www.epa.gov/radtown/nuclear-plant.html

Later in the same paper, the student addresses the responsibility of scientists to balance technological advances with the needs of the public (Excerpt F).

Excerpt F – Ethical Implications

> As use of nuclear energy advances, scientists must consider the implications and possible risks of building these reactors near habitable areas. They must also devote full attention to the safety measures necessary to keep the reactors under control.

These excerpts demonstrate the primary goals of the course: understanding the importance of objective, clear technical communication that shows respect for the reader and learning to see the ethical obligations of experts as communicators.

COURSE ASSESSMENT

At the end of each semester, students complete standard course evaluation forms that use a Likert scale (disagree-agree responses). Of the eleven statements on the evaluation form, four are particularly relevant to first-year seminar goals. Results from fall 2010 and fall 2011 are shown in Table 2.

Table 2. Student Responses to Likert Scale Statements

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
The instructor created high expectations for the class.	0	0	0	6	9	4.55
The instructor made class interesting.	0	0	0	0	15	5
I learned a great deal in this class.	0	0	0	4	11	4.75
The presentation of the course content helped me learn in this class.	0	0	0	2	13	4.9

The evaluation form also invited course comments. Comments included descriptions of the course as "fun and helpful" and "extremely interesting." One student wrote, "I learned a lot and I enjoyed coming to class." Because only 15 students were enrolled in the course during the two semesters included, few definitive conclusions can be drawn from such a small sample size. Overall, however, the course seems to hold students' interest while challenging them.

FUTURE MODIFICATION

The greatest challenge of teaching the seminar has been promoting the course and increasing enrollment. Each fall, MSU offers 30–35 first-year seminars, and many freshman engineering students choose a seminar that introduces a particular major. Although course flyers and information were distributed to the undergraduate advisors in all eight engineering departments before the fall 2012 semester, enrollment did not increase substantially (12 students). While small class size is advantageous in a writing course, the enrollment goal is 20 students. For fall 2013, the target audience will be expanded to include all scientific disciplines, with course flyers sent to the appropriate departments. A second challenge is ensuring the assignments are helpful to freshmen trying to choose a major and career path. Additionally, freshmen need to see the importance of strong communication skills in their respective fields. For fall 2013, students will be required to include an interview with an instructor as one source for their research paper and presentation. This requirement is also intended to open a dialogue between students and the faculty in their departments.

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