Using science fiction to teach science, fiction, and communications skills

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Summary. The two courses “Do Androids Dream of Electric Sheep?” and “To Boldly Go” form a year-long sequence of a science-fiction-based section of St. Lawrence University’s First-Year Program [FYP]. The FYP is a yearlong course required of all entering students, which teaches communications skills in a team-taught, multidisciplinary setting. The course allows the instructor to teach science -- from paleoanthropology to astronomy -- and fiction -- from Robert Heinlein to Philip K. Dick -- in the context of a general education course in formal written composition, oral presentation and academic research.

Introduction: The First Year Program and Science Fiction Studies

Over the last few decades, many North American colleges and universities have been designing new programs specific to the needs of freshman. A recent survey of over 300 US colleges and universities, ranging from two-year colleges to PhD-granting research institutions, found that nearly 3/4 had recently launched a faculty development initiative focusing on the first year. Over 100 colleges and universities consider themselves as engaged in innovative initiatives aimed at first-year students. Over 70% have some sort of “First year seminar” or “extended orientation class” and over 2/3 of all 4-year institutions require at least one common course of all incoming students, most often the traditional “Freshman Composition” course.

The chief focus of many of these programs is the teaching of college-level communications skills, particularly writing, and they occur at the same time that many institutions are launching initiatives on writing across the curriculum [WAC] and other writing programs. Communications skills are seen as central to students’ success in their academic careers, and such programs allow the institution to raise its own expectations about the quality of the writing of its continuing students.

St. Lawrence University [SLU] inaugurated its own First Year Program [FYP] in 1988. A primary focus of the FYP is to teach both oral and written communication skills. In its present form, all entering students enroll in two consecutive one-semester courses, known as the FYP course and the First Year Seminar [FYS]. The FYP course is team-taught, interdisciplinary and residential: all of the students in an individual course, or “college”, live in the same dormitory, and are taught by a two- or three-person team. The FYS is taught by a single instructor and no longer retains its residential aspect. Students are free to select from a variety of FYP and FYS sections thematically based on topics spanning the curriculum.

One of the greatest continuing challenges to the Associate Dean of the First Year has been the difficulty in recruiting faculty from the natural sciences. While there has been interest in WAC among faculty in the natural sciences, many scientists have no experience in teaching communications skills, and do not use writing in the same way in their professional research as their colleagues in the humanities, arts, and social sciences. Team teaching in the FYP does, however, act as a mentoring program for initiating science faculty into the teaching of writing and oral presentation.
Still, science faculty who do participate in the FYP discover a number of rewards. First, it allows natural science faculty to participate in the general education of the college, an important niche which the SLU physics department has supported for decades through courses in astronomy, weather, climate, energy, and space exploration. As such, it gives us another opportunity to teach science to future citizens, particularly those whom we might not reach through our other general education courses. Second, it gives us further chances to recruit into our major uncommitted students -- the so-called second-tier students -- who have the skills to excel in science, but who often lose interest in science in high school or early college. Teaching in the FYP also allows for interaction with other faculty colleagues outside of the natural sciences. Finally, the faculty development involved in learning how to teach communications skills can be applied to the physics majors’ course of study, particularly in the department’s upper level formal laboratory reports and senior-level independent lab project.

Science fiction studies have found a foothold in many corners of academia. In addition to courses in English and Physics departments, a cursory Internet search finds SF courses in college and university departments of Biology, Cognitive Science, Philosophy, Political science, Psychology, Religion, and Sociology. Surely some of the reasons for this success is the popularity of SF in popular culture. One assumes that students find it less daunting to take a course in say Star Trek, Star Wars, or The X-Files than in Chaucer or Pynchon. A colleague’s suggestion that an FYP course in science fiction would attract an interesting crowd of students led us to conceive of SF as a way to bring science (and scientists) into the FYP in a novel, creative, interdisciplinary way.

**SF in the FYP: Teaching content**

Obviously, SF courses taught by biology and religion departments will focus on different issues and face different challenges. Implementing SF into the FYP presents its own particular challenges. The principal constraint is one of content: the focus in the FYP on communications skills over content dramatically reduces the amount of fiction one can cover. This constraint means that the course cannot be a “survey” of SF: there simply is not enough time to give a true, representative survey of the genre. It also prods the instructor into relying mostly on primary science fiction texts, rather than books about SF, such as Krauss’ The Physics of Star Trek: the instructor and the class must analyze the texts themselves for science content. Finally, this content pressure forces the instructor to revisit the question of what exactly is the point of using science fiction in the course.

We found a useful rationale and unifying principle for this course in Horace’s observation that the purpose of literature is to “delight and instruct”. This permitted us to explore issues of literature and issues of science: a useful subset of SF studies for a team consisting of faculty from the humanities and the natural sciences. Further, given our combined interests in biology and evolution [JG] and math and physics [DK], we mapped out a small number of specific scientific areas that we felt comfortable teaching. (See Appendix A)

We organized the content in this course by means of a few specific themes, with various novels, short stories, technical essays, and films representing each theme. We supplemented these works with guest lectures from experts across campus and the community on the geometry of the Universe, the Neanderthals, and artificial intelligence, with each talk supplementing specific SF readings. These guest lectures proved to be one of the most popular parts of the course.

The pressure of including less content in this course also increased our reliance on popular commercial films as texts in the first semester of this course, and short stories, many of them available online, in the second semester. (See Appendices A and B.)
One of the biggest challenges of teaching this course has been to convey the concept of science as a process, rather than a collection of facts, to a group of students who range in science background and interest from the very well-prepared and highly motivated to those for whom the fiction of SF is the most attractive feature and the science is irrelevant and incomprehensible. Given the large number of students (over thirty) and the constraints on time, the possibility of using a laboratory component to teach the process aspect of science was considered too daunting to pursue. However, in the second semester, one of us chose a project of model rocket launching to illustrate the process of doing science, with the added feature that we could use writing to organize our thinking about the project. We organized this project around a central, thesis question (Would it be possible to send these model rockets into orbit?) and divided the pre-experiment phase into six projects pursued by separate groups that then shared their results with each other via written reports. The connection between the content and the process allowed us to stress the idea of writing across the curriculum, and the role of writing in natural science coursework, particularly in formal laboratory reports. We hope to incorporate more collaborative lab learning in future versions of this course.

SF in the FYP: Teaching skills
While the course was partly organized around thematic issues of content, much of the organization of the course was informed by specific skills we needed to teach. As a mandated, college-wide course, certain minimum requirements must be built into the design of FYP/FYS courses, almost exclusively related to skills, not content. In addition, there is a programmatic emphasis on use of multiple drafts and in-class "free-writing", which we followed.

Specifically, the first semester requires a minimum of two oral presentation assignments, and three short papers (generally understood to be 2-3 pages, double-spaced, i.e. about 1000+ words). It is common practice in these courses to combine assignments, so that an oral presentation can be linked to a written assignment on the same topic. In both of our oral presentation assignments, we also tried to link the science and the fiction thematically. The first assignment, about halfway through the semester, required each student to find some idea in science or technology that originated as science fiction, but that has since become "science fact". Students also presented this research as a short written essay. In the last three weeks of class, students reversed this process: each student researched some area of science with a partner, delivering a group oral presentation and then, individually, wrote a 10-12 page piece of science fiction based on the science or technology they had researched.

The primary focus of the FYS (second semester) is typically a 10-12 page research paper. Exercises throughout the semester focus on the various stages in the writing of such a paper: initial research, evaluating sources, narrowing down the thesis, outlining, crafting a logical argument, matching sources to arguments, rewriting, proofreading, etc.

In addition, in this particular section of the FYS, each student executes three shorter projects that combine written composition and oral communication. Each of these projects is associated with one of the three major thematic divisions of this particular FYS course, but the order of each type of presentation varies from student to student. During each thematic section of the course -- space travel, time travel, and extraterrestrials -- roughly one third of the class will present a summary of some relevant issue of science or technology, one third will lead a class discussion of a work of fiction, and the other third will participate in a debate on a topic chosen by the professor. In the course of the semester, each student presents one of each type of assignment, and presents once during each of the three thematic divisions of the course. At the end of each thematic division, all students submit a two- to three-page written summary of their presentations.

Results and conclusions
So far, the authors have taught this FYP course only once, and are now in the process of teaching the FYS course. While most of our impressions of our successes and failures are anecdotal, clearer information can be gleaned from our end-of-semester student evaluations.

While program-wide evaluation is done in all FYP courses, none of the questions on the evaluation forms directly evaluate student perception of the material covered in the individual class. On the other hand, there were a few questions for which responses were markedly higher for students of the SF FYP, relative to the mean campus-wide averages. For instance, quality of instruction was rated ‘Very Good’ or ‘Excellent’ by 93% of the SF FYP students vs. 64% for the rest of the FYP. Moreover, 82% rated “out-of-class events”, including speakers and films as ‘Very Good’ or ‘Excellent’ vs. 67% for the rest of the FYP. This we attribute principally to the use of guest lecturers and SF films.

In the open-ended evaluation questions, students most often noted the contrast between the skills brought to the classroom by the two faculty teammates from the humanities and the natural sciences. While students generally declared this combination to work well, we find that their perception profoundly misreads the backgrounds, aptitudes, and roles of the two faculty in the classroom (given, for example, the strong disciplinary science background of the humanities team member). In retrospect, this is not surprising, but it represents a challenge for us to get students to confront their initial expectations of the instructors’ roles.

All in all, the authors found the course intellectually stimulating and the level of student intellectual engagement high. The quantity of good fiction and the breadth of science represented within SF makes it fairly easy to mold such a course to the particular backgrounds and interests of individual instructors. This flexibility makes an SF college a good candidate for recruiting more science faculty into the FYP as well as for engaging students more effectively in the work of the FYP.

APPENDIX A: FYP “Do androids dream of electric sheep?” (First semester):
(See http://it.stlawu.edu/~koon/classes/FYP/androids.html for more detailed syllabus.)

Course description
Horace said that the function of literature is both to delight and to instruct. Few literary genres reflect the wisdom of his claim more clearly than science fiction, which allows us to wander among strange figures in exotic worlds while we learn (almost despite ourselves) about science and the complicated ways it affects human lives. In this course we will explore some of history's most delightful and instructive science fiction novels, short stories, and films: from classic novels like Huxley’s *Brave New World*, to short stories by masters like Asimov and Heinlein, to films like Andrew Niccol’s *Gattaca* and Ursula K. LeGuin’s *The Lathe of Heaven*. As we study these works we will have at least three goals in mind: to experience the pleasure of losing ourselves in works of science fiction, to learn some of the science on which these works are based, and to investigate how it is that science can be portrayed both as humanity’s precious gift and its dark curse.

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<th>TOPIC</th>
<th>TEXT and GUEST LECTURES</th>
<th>MAJOR ASSIGNMENTS</th>
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<tr>
<td>What is SF?</td>
<td>Invaders -- Kessel</td>
<td>Paper #1: 2-3 pp</td>
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<td>Lifeline -- Heinlein</td>
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<td>The time machine -- Wells</td>
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<td>What’s in store?</td>
<td>Brave New World -- Huxley</td>
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<td>(The Future)</td>
<td>Mr. Tompkins in paperback -- Gamow</td>
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<td>Film: Gattaca</td>
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<td>Film: Lathe of heaven</td>
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<td>And he built a crooked house -- Heinlein</td>
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<td>Guest: Geometry of the Universe</td>
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<tr>
<td>What’s your favorite?</td>
<td>Film: The Matrix</td>
<td>Paper #2: 2-3 pp</td>
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| (Students’ choices)                  | Film: Mars Attacks!  
Radio broadcast: War of the worlds | Individual oral presentations: ‘Science fiction that has become science fact” |
|-------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------|
| What is human?                      | The Inheritors -- Golding  
I, Robot: Escape! -- Asimov  
Film: Blade runner  
Guest: Neanderthals  
Guest: Artificial intelligence |                                                                                 |
| What’s your idea?  
(Students’ original fiction)         | None                                                                             | Group oral presentations: 2-person oral presentation on some science topic  
Final written project: 10-12 page work of fiction, based on same topic as oral presentation, but written individually. |

**APPENDIX B: FYS “To boldly go” (2nd semester):**  
(See http://it.stlawu.edu/~koon/classes/FYS/ToBoldlyGo.pdf for more detailed syllabus.)

**Course description**
Is the shortest path between two galaxies always a straight line? Is time a one-way street with a fixed speed limit? Will we ever find evidence of extraterrestrial intelligence, or have they already found us? People have fantasized for centuries about trips across galaxies and through time. But will mankind -- or alien civilizations -- ever escape the limits of the here and now? In this course, we will use lecture, seminar, and laboratory to explore speculations about time, space, and the development of intelligence in both science and science fiction. Students’ work will culminate in written and oral presentations of their own research on specific scenarios for time travel, interstellar space travel, and the search for intelligence outside our planet. While science readings will be geared to non-scientists, and use of mathematics will be minimized, students are forewarned that we will be doing real science in this course, in addition to studying fiction.

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<tr>
<th>THEME</th>
<th>SELECTED TOPICS</th>
<th>SELECTED FICTION</th>
<th>DEBATES</th>
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| Space travel           | Generation ships  
Solar sails  
Wormholes  
Tachyons  
Warp drive | Baron von Munchausen  
Cyrano de Bergerac  
Film: Contact  
The wind from the sun -- Clarke | Were the Moonwalks faked?  
Will humans ever leave the solar system? |
| Time travel            | Predestination  
Gott time machines  
Tipler time machines  
Chronology protection conjecture  
Time branching and alternate universes  
Entropy and the direction of time | Slaughterhouse V -- Vonnegut  
A sound of thunder -- Bradbury  
All you zombies -- Heinlein  
All mimsy were the borogoves -- Padgett  
Counterclock world -- Dick  
Fire watch -- Willis  
Film: Minority Report | Will humans ever travel backwards in time? |
| Extraterrestrials      | Non-carbon-based life  
Panspermia  
The Drake equation  
Life in the solar system  
Extrasolar planets  
Exotic communications  
Historical & Biblical accounts of extraterrestrials | Film: Alien  
First contact -- Leinster  
Sentinel -- Clarke | Will humans ever contact intelligent life from outside our own planet? |

**Assignments**
For each of the three themes, each student is required to prepare one in-class, 30-minute presentation and a 2-3 page written summary on the same topic. One of these three assignments is a discussion of a technical issue, another is a discussion of a work or work of fiction, and one is a debate on a topic chosen by the instructor. In addition, students are required to complete a semester-long written project, a 10-12 page term paper on a thesis stemming from the topic of the technical presentation mentioned above.

References


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