Science and Science Fiction in an Interdisciplinary First-Year Experience Honors Course

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Abstract: Engineering and pop-culturist instructors team-teach a first-year experience course exploring science through the lenses of history, literature, film, television, and sequential art. Authors present science fiction discourses as unique for synthesizing fields in the humanities and STEM, and they present curricular and co-curricular design strategies for harnessing its potential in the honors classroom. Course objectives and outcomes are presented, with authors noting specific challenges in implementation and emendation. Adaptability and compatibility figure prominently in the successful delivery of the course. A review of literature relating to interdisciplinary education and team-teaching in honors is included.

Keywords: higher education—honors programs & colleges; teaching teams; science in popular culture; curriculum planning; Texas Tech University (TX)—Honors College

INTRODUCTION

The Texas Tech University Honors College has promoted innovative teaching models for many years. Former Honors College Dean Gary Bell discussed "The New Education Model" in the *Journal of the National Collegiate Honors Council* in 2008, mentioning innovative concepts such as experiential learning, interdisciplinary study, and team-teaching as means to enrich the educational experience of honors students (Bell, 2008). Course innovation is a hallmark of honors education. Multiple educational models

provide this innovation, including team-teaching, group assignments and projects, interactive discussion-based classes, and courses based on current popular themes and issues (Hanbury & Rosenblum, 2015). These innovative concepts are key in describing how honors education can be different from but not necessarily more difficult than non-honors.

Changes in the traditional education model provide key differences and enrichment in honors education (Lacey, 2005). Interdisciplinary teaching methods are a hallmark of honors education and differentiate it from more traditional multidisciplinary teaching approaches. For example, traditional multidisciplinary approaches often do not underscore how a topic can be interconnected across fields; instead, the topic is siloed in each field. Team-teaching, therefore, can be multidisciplinary or interdisciplinary based on the interaction between instructors and the establishment of disciplinary links. Furthermore, on the job market, the demand for science, technology, engineering, and mathematics (STEM) graduates has exceeded the supply. Thus, having a financially successful career is often associated with training in a STEM field, yet employers are also looking for personnel who have communication skills and can think critically, which are "soft" skills commonly associated with the humanities (Crawley et al., 2014). An argument then exists that a more liberal and interdisciplinary education that combines STEM with the humanities may be a pathway to develop STEM personnel with these "soft" skills (Baillie, 2009; Zoltowski et al., 2012). The combination of STEM and the humanities courses can provide an outlet for combining the "hard" technical skills of STEM with the critical thinking and communication skills needed in this ever-evolving landscape. An honors education is the ideal place for these collaborations and course designs to take place (Krsmanovic, 2019).

Science fiction is a popular theme we have used at the Texas Tech University Honors College to develop a first-year experience (FYE) course. What we strive to do with these courses is create an interdisciplinary approach that connects science fiction and popular culture with scientific methods and ideas in a way that is easy for students to follow. Without being too technical or conceptual, the FYE courses are accessible to all majors, viewing science and science fiction through a lens of history, popular culture artifacts, literature, sequential art, games, various media, and film. These different types of media provide students with a wide variety of materials giving them perspective on how science and popular culture intersect. In the analysis of this course, we will discuss the honors-related literature that has helped inspire our thoughts on interdisciplinary education and team-teaching, a contrast and comparison

of the iterations of these courses, and the perspectives of and lessons learned by the instructors.

BACKGROUND

The literature on honors education literature has been key in building and developing interdisciplinary courses such as our Science and Science Fiction FYE and Summit courses. Interdisciplinary education can cover many areas from course topics, teaching models, and honors implementation. With such variance, we structured the approach in developing our course by understanding the basis of honors interdisciplinary courses and implementations along with popular culture and science fiction in interdisciplinary honors courses.

Finding the links between disciplines. "Interdisciplinary" can cover integration among multiple disciplines and fields from the humanities to the STEM fields and in-between. Interdisciplinary study not only establishes the links between disciplines but also provides an understanding of an ever-complex world. At Belmont University, for example, the honors college has instituted an FYE course—Honors Analytics: Science—that takes an interdisciplinary approach to comparing scientific disciplines, requiring students to understand and question the links between the sciences (Campbell et al., 2012). Interdisciplinary education has served to solve complex problems that cannot be adequately addressed through a single discipline because it requires the breaking down of the disciplinary silos that are often found in undergraduate education. In this vein, Baker and Pollard (2020) discuss a set of honors classes from different disciplines dealing with the issue of what it means to be human. At end of the semester, the classes were combined, and students taught their perspectives on what they had learned about what it is to be human. Students acknowledged the need for interdisciplinary instruction and focus to solve complex issues and problems (Baker & Pollard, 2020). From wars, pandemics, and climate change, this understanding becomes essential for the survival of humanity (Ewing, 2022).

Transformational experiences and skills. Das et al. (2021) direct honors educators to "help students develop the skills and strategies for solving difficult problems while at the same time providing a transformational learning experience" (p. 72). They describe a FYE interdisciplinary team-taught course that covers biology, foreign languages and literature, business, fine art, and design. The end result is a transformative experience where students must critically assess and reexamine their worldview (Das et al., 2021). Dunbar

et al. (2013) discuss an honors interdisciplinary community-based research course that incorporated a biology instructor and a psychology instructor to address environmental watershed issues. The involvement of the community enriches the experience for the students going beyond more traditional interdisciplinary science courses (Dunbar et al., 2013). Jacobs and Walsh-Dilley (2018) discuss an experiential interdisciplinary course dealing with the sociology, art, and history of incarceration. Thinking beyond themselves and considering individuals impacted by injustices of the criminal justice system builds the "depth of field" for the students, cultivating and growing their empathetic skills (Jacobs & Walsh-Dilley, 2018).

Popular culture and science-fiction in honors. The honors program at Butler University developed an interdisciplinary course focused on the history, politics, and music of the popular musical *Hamilton*. A deliberate interdisciplinary focus in the planning of the course was made that would engage students in the links between these disciplines, providing a more diverse discussion than in only a multidisciplinary form (Jones & Shufeldt, 2021). Faidley (2021) discusses the use of movies centering on college life as a popular culture element worthy of analysis in an interdisciplinary colloquium. Similarly, Donovan (2007) provides an approach to popular culture analysis related to monsters and realms of the otherworld. Themes that center on popular music and politics have also been taught in interdisciplinary honors courses (Gertsenzon, 2021).

Science fiction is a subset of popular culture that has provided ample opportunity for interdisciplinary honors with natural links between the humanities and STEM disciplines, covering many societal issues of the past, present, and future including evolution (Bixler, 2007), biology and astronomy (Lacey, 2005), and ethics (Burgess, 2019). Science fiction courses can also enhance writing and critical thinking skills. At the University of Witwatersrand in South Africa, first-year engineering students take an interdisciplinary course that uses science fiction to teach and enhance skills such as writing and critical thinking, addressing problems and issues in society in a holistic way (Manià et al., 2018). In another holistic application, science fiction has been used to teach thermodynamics in a general chemistry course, motivating students to consider concepts of global warming within the technical field of thermodynamics (Liberko, 2004). Watkins and Tehrani (2020) discuss using creative writing as a mode for breaking down the divide between humanities and STEM disciplines in readings such as Mary Shelley's *Frankenstein* and Alan Lightman's *Einstein's Dreams*. These influences challenged STEM students to

think and write beyond their typical academic approach by building worlds and considering the problems, people, and characters involved in those worlds (Watkins & Tehrani, 2020).

Science and Science Fiction FYE. Our focus in developing the Science and Science Fiction FYE course was integration of STEM fields with the humanities. We believe such integration provides an enriching, transformational experience for students and especially promotes the humanities to STEM students. Many people believe that the growth of the STEM fields is paramount in a technological age; as Ketcham (2015) argues, the promotion of STEM is not the death of humanities but an opportunity to use the skills of communication, creative thinking, and empathy to enlighten STEM and to solve the complex issues of society.

FIRST-YEAR EXPERIENCE:
THE POWER OF SCIENCE FICTION AND SCIENCE THROUGH HISTORY, LITERATURE, FILM, TELEVISION, AND SEQUENTIAL ART

The idea for our course is to combine scientific and humanities approaches to give students a wide range of ideas and material that is both relevant in a contemporary sense and relates to the history of science fiction and its essential milestones. One of the goals of the course is to expose students to an interdisciplinary approach that links popular culture with science and engineering while using different teaching materials that include sequential art, novels, film, scientific reading, contemporary scientific advances, and history. In addition, various materials allow students to be creative in their assignments and projects while showing an understanding of the science behind their creations. Between 2018 and 2021, we taught the FYE course four times.

Space, time-travel, and superheroes. The FYE class is basic in its conceptualization and in how we approach science fiction as an area of study focusing on specific science fiction tropes. For example, we first read Jules Verne's *From the Earth to the Moon*, originally published in 1865 and translated into English in 1867, which began our discussion on space travel. Verne was using the science of the time to create his story about the Gun Club shooting a projectile to the moon. His language is wordy and sometimes off-putting to students although some find many of the portions of the novel to be hilarious. Students may find the book dull or compelling, but it is a good place to start because it is one of the first "hard science" novels that establishes a historical

basis of science fiction and demonstrates what was right or wrong (mostly wrong) scientifically.

Proceeding with our space travel portion, students read and discuss *Spawn of Mars*, a series of comics from the 1950s. The students get to learn the history of when these works were produced and the culture of the time. They further discuss the science or lack thereof in the stories. The use of sequential art—i.e., the combination of visual and narrative language sometimes referred to as "comics," like *Spawn of Mars*—provides diversity in the course content. As an accepted form of media in education (Ayers, 2010; Bakis, 2012; Dong & Weiner, 2012; Kirtley et al., 2020; Rourke, 2010; Syma & Weiner, 2013), sequential art is often concerned with time travel, which is the next science fiction topic covered for our FYE. We have students read the graphic novel adaptation by John Jennings of Octavia Butler's time travel novel *Kindred*. The graphic novel describes a young African American woman from 1976 who suddenly goes back in time to the antebellum south to save a relative who happens to be Anglo. The novel contains episodes of her having saved her relative, showing the horrors of slavery and the societal norms of how African Americans were treated. Our purpose with *Kindred* is to provide a powerful story about time travel that cultivates a sense of empathy for those in history and understanding the effects that have carried through to the present day. Of Butler's novels, *Kindred* and *Parable of the Soul* are among the most commonly taught works on college campuses. Some feel *Kindred* is not science fiction because it does not have futuristic tropes, aliens, spaceships, or unique technologies attached to it. Time travel is the only science fiction element, which makes it a difficult book to see as science fiction, yet it gives students another perspective on science fiction as something they can relate to in other novels, movies, and video games.

After covering space and time travel, we conclude the course with superheroes. We have students read the first Superman story from Action Comics #1 alongside Philip Wylie's *Gladiator* from 1930. Wylie's book, which most people have not heard of and is his only book remaining in print, provides a story that parallels Superman and Captain America. Like with *From the Earth to Moon*, students find the narrative a bit wordy but enjoy the story and sympathize with the book's protagonist, Hugo Danner, as a super being who cannot live a normal life.

STEM assignments and journals. Most assignments follow the science fiction topics covered throughout the semester. However, student journals are one set of assignments that do not necessarily follow specific topics. Students

are required to complete four journal assignments relating to scientific advances within popular culture. Because technology changes at a lightning pace, students need to see how society is impacted by technology. Further, students are asked to talk about their college experience in relation to these impacts. While topics are not specified, many students see their scientific/technological and popular culture relationships with topics like social media, ride shares, and e-scooters. Students do not always enjoy writing this kind of personal testament, but they see how scientific advancement, both positive and negative, comes about and affects the world around us.

In addition, we have students complete two STEM assignments designed for students to consider science and engineering within the context of science fiction. The first assignment asks the students to consider a problem within *From the Earth to the Moon* or *The Spawn of Mars* and to solve the problem using the Define, Measure, Analyze, Implement, and Control (DMAIC) problem-solving methodology from Six Sigma manufacturing and management enterprises (de Mast & Lokkerbol, 2012). This assignment makes students understand and connect many fields together by understanding the science and engineering behind their solutions while showing an understanding of the historical constraints of the time the work was published, the societal and cultural beliefs of that world, and the behavior of the characters in the work. Students are open to discuss and analyze any problem that interests them, gaining practical experience in problem identification in contrast to their typical experience of being given problems to solve.

The interdisciplinary nature of the problem-solving assignment hints at the morals and ethics needed in problem-solving. The second STEM assignment explicitly attempts to help students understand the morals and ethics of their own lives by researching a famous quotation from *Spider-Man*—"With great power there must also come great responsibility" (Lee & Ditko, 1962, p. 11)—and connecting it to scientific and engineering discovery. Further, they are asked to relate to this quote personally by asking themselves how they can use their gifts, skills, and knowledge ethically and what lines they can draw that would prohibit them from unethical behavior. This assignment becomes another avenue to understand the connection that STEM fields and the humanities have in this world and how they can relate to it.

Science fiction presentations and final project. One of the best parts of the class for both instructors and students is delving deep into science fiction writers by having students write a paper of 500–1,000 words on one of them as well as make a 5–10-minute presentation. We try to cover the whole gamut

of science fiction writers from the obscure, like Edwards Mitchell, to contemporary authors like Nnedi Okafor. The history of science fiction and its ever-growing presence provides many past and contemporary authors, showing students that science fiction has become a part of our cultural landscape. As William Gibson, the writer of *Neuromancer*, states, "I think science fiction gives us a wonderful toolkit to disassemble and reexamine this kind of incomprehensible, constantly changing present that we live in, that we often live in quite uncomfortably" (Gibson, 2012). While focusing on the future, science fiction provides an understanding of what is happening culturally today and speculates about what is to happen in the future (Seed, 2011).

Students also write a 300–600-word paper and give a 5–10-minute presentation on a science fiction film. Often more contemporary films are assigned, but sometimes students are willing to present on films from the 1950 or 1960s. We show trailers from that era to give students a historical reference for science fiction films and show where many of the tropes have been developed. Students can also present on a science fiction video game. We bring a guest speaker—Matt McEniry, Metadata Librarian and Director of Texas Tech Digital Scholarship Lab—to talk about artificial intelligence (AI) in video games.

In the first three of our FYE classes for the final project, we allowed students to brainstorm in groups of three to four and create their own science fiction short story, comic strip, or film; most of the students went the short story route. While we have received many excellent stories, we felt a short story was not rigorous enough for a final project. For example, the short story had a limitation of 1,500 words while the comic and film required not only the end product but a short synopsis of 300–600 words. This added work seemed to make the short story the "easy way out" for students. Thus, in the fourth iteration of the class, we required students to create a comic or a film, allowing students to use more creativity by not only devising the story but formulating ways to present it visually. With these added elements, the project became a bit more complicated, combining organizational and creative skills with writing, plotting, acting, drawing, and illustrating. This project might have been the only opportunity students had to use and develop such skills in a creative endeavor that could correlate to their academic career. One of the reasons we did the group project was to build teamwork skills, which are necessary when students graduate and go out into the world, where they will have to work in teams and get used to working with people who are outside their field and whom they will sometimes not like.

Reflections

Content Issues. With the development and implementation of our science fiction courses, we have learned lessons that led to changes in the course(s) throughout their various iterations. For the most part, changes have been minor as far as the content presented. For example, to accompany our discussion on AI, we have watched popular shows like Netflix's *Black Mirror* or Adult Swim's *Rick and Morty*. We have also included short discussions of science fiction in music, exploring Pink Floyd's "Welcome to the Machine" as well as albums like *Dark Side of the Moon* and Kenny Rogers's "Planet Texas." Content like this has changed from year to year based on time limitations created by lengthy class discussions and student presentations. Time limitations have also been an issue with student presentations. Even though we have time limits on presentations as well as discussions, the interest and excitement in a topic often exceed the limit. In the later iterations of our courses, we have been stricter on time limitations, which has helped us keep on schedule and maintain meaningful discussions on all the topics planned for the course.

Planning and development. Planning has been critical to the success of our courses and the shared aspects of our courses require extra effort. Both instructors attend and contribute to every class, requiring extensive planning for the semester and each class schedule. For each course iteration, we met and discussed the course schedule well before the semester began. Between classes, we discussed the content to be covered, who would cover the content, and how the discussion would be carried out. After class, we reviewed how the class went, discussed possible changes going forward, and prepared for the next class. This planning cycle kept us to our class schedule and helped our courses evolve during the semester and between iterations. Understanding the literature on team teaching was essential in establishing best practices (Carrell, Cruz, & Kuzmack, 2020; Weiner, 2022).

Work Outside the Classroom. For the instructors, work outside the classroom has focused on educational research to better understand the benefits of interdisciplinary education. Our research avenues have been twofold. The first is the integration between STEM disciplines and the humanities. Specific grants through the National Endowment for the Humanities (NEH) encourage this integration and other ways of including more of the humanities in higher education. We have been lucky to receive an NEH Connections Planning grant (Award AKA-265769-19) and an NEH Humanities Initiatives at Hispanic-Serving Institutions grant (Award AC-269259-20) for the development and implementation of our course and other interdisciplinary offerings

in the TTU Honors College. Combining the humanities and STEM fields benefits students' learning environment and prepares them for an increasingly complex world where science, engineering, and technology are ever present in our society and culture.

On a broader level, our research has considered problem-solving in interdisciplinary contexts. For example, Polk (2013) discusses an interdisciplinary honors course taught by a kinesiology professor and a communication studies professor titled "Self-Awareness and Development." With a focus on problem-solving, scholarship, service, teamwork, and leadership, the course sought to cultivate students' self-awareness by exhibiting the links between the disciplines and their relationship to society (Polk, 2013). Chaney et al. (2020) discuss a program from East Carolina University that promotes community engagement through design thinking in two-semester courses for first-year students. Problem identification, research, and analysis are the focus of the first semester, and solving the problem is the goal during the second semester. The problems are pertinent to the students and typical among college students across the nation. The analysis and solving of these problems relate the students to their college community and have them consider and empathize with the community affected by the problem (Chaney et al., 2020). Although on a much smaller scale, our problem-solving assignment attempts to cover much of the same ground, developing a more significant relationship to the content presented and deepening emotional and empathetic understanding (Carrell, Keaty, & Wong, 2020). To help us gain knowledge and understanding of the changes to the problem-solving process within interdisciplinary courses, we have received a National Science Foundation (NSF) Improving Undergraduate STEM Education (IUSE) grant (Award DUE 2142666).

CONCLUSION

Interdisciplinary education promotes understanding the links within the academic world and how these links reflect our societal needs. Students are charged with being curious about questions of what, why, and how, and this curiosity is the road to greater understanding, whether within a discipline or society. By integrating science with popular culture through science fiction, our course shows how science and technology impact our social world. Further, in the words of West et al. (1991), students "must learn to deal with error as a source of information, as an essential part of the process of discovery. When they see science in its historical context, their own experience takes on a new meaning; maybe the wrong answer isn't wrong. Maybe it's simply

an indication of limits of equipment, method, or even scientific knowledge" (p. 6). Our courses show students how to address this kind of error by blending cultural and historical aspects with scientific and engineering principles. Honors courses and programs, especially team-taught and interdisciplinary, can foster this sense of curiosity through the instructors' enthusiasm. Instructors, who themselves are experts in a field, understand that their specialization provides only a partial understanding of the world, and collaboration is a means to provide a more holistic and complete perspective. In our courses, we strive to give students a taste of how science fiction and science intersect with the world, providing real-life and fictional examples that challenge students to question the world around them and see possibilities of what the future might hold.

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