3.22 STEM Students as Storytellers: Media Journals

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3.22.1 About the Module

- Course: Mathematics for Liberal Arts (used in How Fiction, Film, and Popular Culture Represent Science and Mathematics at Embry-Riddle Aeronautical University)
- Partner Disciplines: Humanities and Communication
- Required Technology: podcasting software, presentation software and/or video editing software. Examples are provided.

3.22.2 Institutional and Course Contexts

- Type/size of institution: Embry-Riddle Aeronautical University (ERAU) is a private institution with residential campuses in Florida and Arizona as well as a Worldwide campus with over 130 global locations and a nationally recognized online program. Worldwide has over 22,645 students, and about 90% of courses are delivered asynchronously online. The university is known for aviation/aerospace programs.
- Size of Class: up to 30 students
- Characteristics of Students: The students are mostly part-time adult learners in STEM programs.
- Mathematical Content: Varies, depending on student selection
- Purpose/Goal of the Module: The Humanistic STEM (H-STEM) focus of the course is reinforced by having students find blends of humanities and STEM outside of the classroom in their everyday lives. Students are compelled to make connections between these meta-disciplines. Doing so allows them to more clearly understand the transferability of skills and concepts from their general education courses into their program courses then into their careers. Students who make these connections then find value in their complete educational experience.
- After and Before: This module comes after an exploration of the concept of Humanistic STEM as a blending of STEM and humanities content and methods of inquiry. Students have watched introductory videos and participated in discussion board activities meant to reinforce this central focus of the course. As their final project, students will create a "trailer" for a new H-STEM project that they are pitching. Therefore, they will continue to deliver multimedia content in the course.

  In other course contexts, it may be useful for an instructor to show how STEM and the humanities impact each other through a short video or guest appearance with a humanist colleague..
- Other Prerequisites: There are no additional prerequisites for this assignment. Students who register for this upper-level course are required to have at least three semester hours in humanities and three semester hours of mathematics. Most of the students in this course have taken precalculus.
- Inspiration for the Module: The inspiration for this module comes from a desire to reinforce the relevance of course concepts outside of the classroom. Understanding the full intellectual context of a work of art, a piece of architecture, or even a film, provides a richer experience in every aspect of a student's life. Students should see the blend of disciplines in the world around them to underscore the artificiality of academic silos. Specifically referring to the project as a "journal" highlights the storytelling aspect of the assignment, giving students license to tell the tale of H-STEM in their lives.

  The Association of American Colleges and Universities (2021) reports that employers prefer graduates who can think critically, solve problems creatively, reason ethically, and communicate effectively. Students often place

these abilities within the domain of their humanities classes. Assignments such as this one are effective in mathematics (and other STEM) courses as they reinforce that disciplinary boundaries are ultimately permeable. Students learn to see how the disciplines impact and influence each other, developing habits of mind that include flexible and interdependent thinking.

3.22.3 Partner Discipline Background

This course is part of ERAU's Humanistic STEM (H-STEM) initiative. We define H-STEM as "blending the study of science, technology, engineering, and mathematics with interest in, and concern for, human affairs, welfare, values, or culture." H-STEM is a way for us to elevate the humanities among our STEM-focused students who often do not value these courses despite the fact that they provide the critical thinking, communication, and creative problem-solving skills that employers value H-STEM compels students to create, to solve problems and to dwell in complexity, resulting in a STEM workforce that has the skills, habits of mind and ways of knowing that foster innovation. H-STEM courses are co-developed, and ideally co-taught, by both humanities and STEM faculty. This specific course (HUMN 333: How Fiction, Film, and Popular Culture Represent Science and Mathematics) is the pilot for the H-STEM concept and also serves as the anchor for a set of courses that uses multiple interdisciplinary lenses to explore important concepts. Other H-STEM courses include digital humanities, data visualization, and the history of communication technologies. Students are able to use HUMN 333 to fulfill the upper-level humanities requirement in the general education program.

STEM-focused students are introduced to the humanities as a meta-discipline that includes languages, literary studies, religious studies, political science, philosophy (specifically ethics), study of visual/performing arts, history, anthropology, archaeology, linguistics, and classics. As such, they learn that the humanities are deeply connected to the human experience. They are also cautioned, however, not to completely conflate "humanities" with "human" and are advised that understanding, investigating, and interpreting are essential elements in the definition of humanities. Through this project, students are asked to determine how the meta-disciplines of STEM and humanities inform and influence each other.

3.22.4 Implementation Plan

Formal Learning Objectives This course requires submissions of four (4) Media Journals by the conclusion of Module 8 (there are a total of nine modules, one per class week). Media journals should be based on examples of the connections between humanities and STEM that students observe in their everyday life. These examples might be from music, television, film, museum visits, newspaper/magazine articles, books, or scenic locations. The goal is to ensure that they see the blend of humanities and STEM that surround us and that they are able to explain those connections. Students also learn to communicate mathematical and scientific concepts in multiple digital formats, a skill that has full utility regardless of discipline, learner level or workforce sector. This assignment is aligned with the following course Student Learning Outcome: "Engage in integrative learning by making connections across disciplines."

Materials and Supplementary Documents Students will need to use podcasting software (e.g. Podbean), presentation software (e.g. PowerPoint) or video editing software (e.g. iMovie). Multiple free options exist. Most students are able to embed their media journals into the Canvas LMS, but others provide links to their YouTube channel or podcasting service so that classmates can "subscribe" to their media journal series.

Time Required Students are required to create four media journals over the nine course weeks. To avoid procrastination, media journals are due in every even-numbered week. There is no specific length requirement for the journals, but they are instructed that length is not a primary concern as long they can be "less than 5 minutes." The time required to complete a media journal varies based on the student's familiarity with the technological tools. Students who record a podcast, for example, may only require approximately two hours to script and record the episode and add theme music. Students who are producing video blogs may need about three hours to gather and organize images, create slides, and record voice overs or add video elements.

Implementation Recommendations This assignment might be different from anything the students have been asked to produce in past courses. Both the technology and content expectations may be unfamiliar to them. As a result,

it is important to provide at least one example. In this course (How Fiction, Film and Popular Culture Represent Science and Mathematics), each instructor produced an example media journal. Dr. Bourdeau added a podcast episode explaining Yayoi Kusama's Infinity Mirrors exhibition. Dr. Wood created a voice-over-PowerPoint presentation on the mathematics and architecture of Machu Picchu. These examples help to ease student anxiety about the project. Additionally, instructors should not strive to provide "perfect" examples, as students need to see that some mistakes might be inevitable and should not lead to increased production time.

Because they are an important component of enhancing student engagement, the media journals should be posted on a discussion board or another "public" part of the course. Students should be required to comment on their classmates' work as part of a discussion or participation grade in the class. A requirement to comment on two additional journals, for example, will ensure that students are reviewing the work of their peers.

Encourage students to step outside their comfort zone to use unfamiliar presentation methods. Make sure you always encourage student to explain the *blend* of the disciplines.

Alternative Solutions Ambitious students might wish to produce animated presentations. KeyShot, PowToon, and Animaker all have free trials or even free versions with limited features.

The assignment states that students are required to use at least two different kinds of media. However, exceptions have been made for students who wish to maintain a podcast series or YouTube channel, particularly those who show interest in continuing the project beyond the scope of the class.

Common Errors and Questions Because of the STEM focus of the institution, students typically have no issues with being able to explore and explain the STEM content, but often have to be prompted to include and discuss the humanities blend. Often, students confuse the meta-discipline of humanities with the more basic ideas of "human" or "humanity." To assist students with understanding the humanities as a group of academic disciplines, we created and added an infographic "What are the humanities?" to further define and explain the humanities and to explain what elements to look for in producing their H-STEM projects.

Tips to Handle Student Resistance Students will often initially resist being pushed out of their comfort zone by being compelled to present their work using technologies with which they may not be familiar. It is important to insist that students produce media journals, however, that feature their voices. This element alone increases the sense of a community of scholars in the classroom, particularly when the course is delivered asynchronously.

3.22.5 Additional Information

Media journaling is applicable in *any* mathematics course where drawing on real world examples of mathematical content is important. The search for the blend of humanities and STEM can be targeted more narrowly to mathematics and still give students experience with considering humanities as an important part of mathematics' role in society.

- Architecture is a blend of aesthetics and engineering, both supported by mathematics. Symmetry and proportion are equally important for a successful project.
- Urban planning blends ethics and aesthetics with science and mathematics. The former pair informs the who, what and where; the latter addresses the how and when of the effort.
- Parks, art museums and concert halls all contain elements of the previous two examples that can serve as places to discover mathematics in student environments.

A media assignment looking for visual mathematics is almost certain to uncover it in a humanities context. Being open to discussion of the real life blending of what seems to be diverse disciplines is eye-opening to students and faculty alike.

There is no activity sheet that is needed for reproduction, nor right or wrong answers. Instead, we offer a grading rubric, a breakdown of what students have submitted, and sample screenshots from student submissions. For more details, contact the authors.

3.22.6 Grading Rubric

The grading rubric we use is:

Criterion	**Proficient**	**Satisfactory**	**Unsatisfactory**
Topic is appropriate for assignment	20 - 15	14 - 10	9 - 0
Student selected appropriate audio/visual tool for presentation	20 -15	14 - 10	9 - 0
Student's presentation clearly establishes a link between humanities and STEM	50 - 40	39 - 29	28 - 0
On-time submissions	10 - 8	7 - 6	6 - 0

3.22.7 Media Journal Submissions in 2020 HUMN 333 Offerings

During the year 2020, the breakdown of submissions were:

By Type		
Podcasts	43%	
Screencasts	55%	
Video Logs	3%	
By Subject		
Subject	Percentage	Example Topics
Technology	24%	Virgin Hyperloop, tech inspired by Star Trek, video games
TV/Movies	15%	*Interstellar*, *Star Wars*, *The Big Bang Theory*
Architecture	12%	Chichen Itza, Sanctuary of Truth, urban planning
Sports	12%	Physical fitness, gymnastics, professional team sports
Arts & Music	15%	Deltron 3000, Space Oddity, Monet, The Rain Room
Other	23%	Art & Eng of Ferrari, Are We Failing our Future?, Storm Chasing

3.22.8 Sample Screenshots

The images below are screenshots of sample student work.

Figure 3.22. Student Screenshot Sample 1

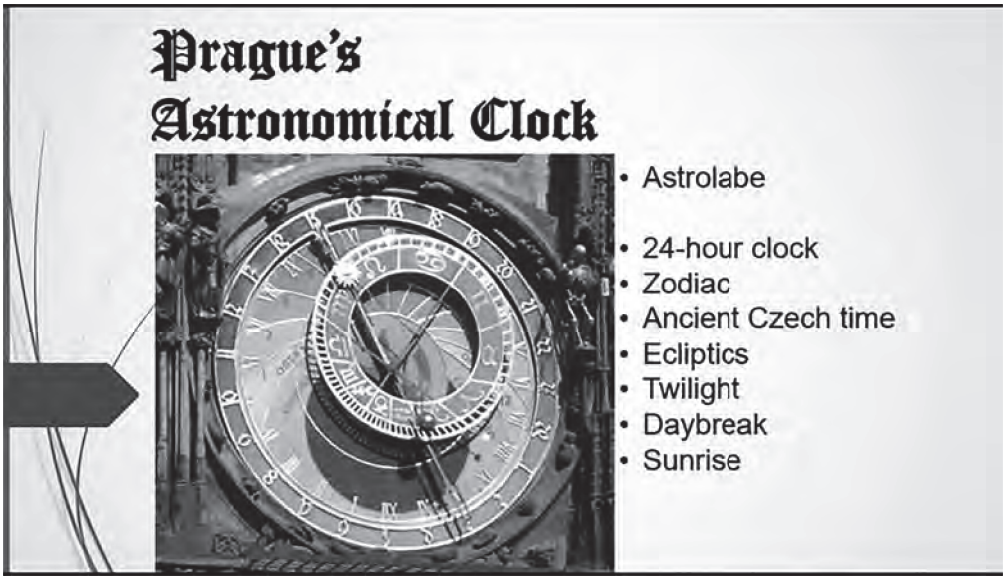

Figure 3.23. Student Screenshot Sample 2

Editors and Acknowledgments

About the Editors

Susan L. Ganter is Provost and Executive Vice President for Academic Affairs at The University of Texas Permian Basin. Her work focuses on innovations in postsecondary STEM curricula, including programs designed to improve success rates for underrepresented students. As an example, Dr. Ganter has been Director (since 1999) for the Curriculum Foundations (CF) Project housed at the Mathematical Association of America, resulting in research on interdisciplinary collaborations designed to support the preparation of students for STEM careers. Currently, she is Lead PI for the NSF-funded SUMMIT-P national consortium of fifteen institutions that are implementing the CF outcomes, and her work has been continuously funded since 1994. Previously, Dr. Ganter was Dean for the College of Arts & Sciences at Embry-Riddle Aeronautical University; a Mathematical Sciences faculty member at Virginia Tech, Clemson University, and Worcester Polytechnic Institute; and a Senior Research Fellow at the National Science Foundation.

Debra Bourdeau is an Associate Dean and Associate Professor in the College of Arts & Sciences at Embry-Riddle Aeronautical University. She is an interdisciplinary humanist holding a PhD in English. She has maintained an interest in intermediality and transmedia storytelling, focused on the intersection of narrative text and visual images and, specifically, on the work of painter/engravers such as William Hogarth and William Blake who sought to construct visual stories through the use of identifiable, recurrent iconography. Her research projects also include Humanistic STEM—a curriculum model that blends humanities and STEM to create a unique interdisciplinary experience that will allow students to integrate ideas, issues, and ways of knowing from diverse academic disciplines in order to expand their capacity for analysis, critical thinking, and creative problem solving.

Victor Piercey is a Professor of Mathematics and the Director of General Education at Ferris State University in Big Rapids, Michigan. His curricular work has involved the interdisciplinary development of a 2-semester sequence of general education courses entitled Quantitative Reasoning for Professionals. Developing this sequence involved collaboration with faculty in business, social work, and health professions, funded by the National Science Foundation. The course integrates social justice, health, and business with mathematics. He also designed and co-facilitated faculty learning community to integrating quantitative reasoning and partner discipline content in math courses and in partner discipline courses. He is currently working on the design and implementation of a faculty learning community to integrate general education and major programs through multi-course student learning communities. He is also currently working on the integration of ethics into undergraduate mathematics and actuarial science courses.

Afroditi V. Filippas is the Commonwealth Center for Advanced Manufacturing (CCAM) Professor at Virginia Commonwealth University (VCU) in Richmond, Virginia. Her role as CCAM Professor is to foster and enable public-private partnerships between CCAM and its industry and academic partners. Her research focuses on data analytics, process modeling and electromagnetic components modeling; her passion is education. Specifically, Dr. Filippas has developed courses geared towards engaging all students in the learning process by blending a variety of teaching modalities and classroom experiences. As part of this coursework development, Dr. Filippas received the "Outstanding Diversity Paper Award" at the 2017 ASEE Annual Conference & Exposition. Dr. Filippas also served as Associate Chair of the Electrical and Computer Engineering department and later as Associate Dean for Undergraduate Studies for the VCU College of Engineering. During this time, Professor Filippas developed and fostered unique undergraduate experiences, such as the da Vinci program and VIP (Vertically Integrated Projects). She also served as mentor to

a number of student organizations, and continues to serve as the faculty advisor to the VCU Society of Women Engineers (SWE) and HKN. In 2019, Professor Filippas also took on the role of joint chapter chair of the IEEE Education Society, Richmond and Northern Virginia Chapters.

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