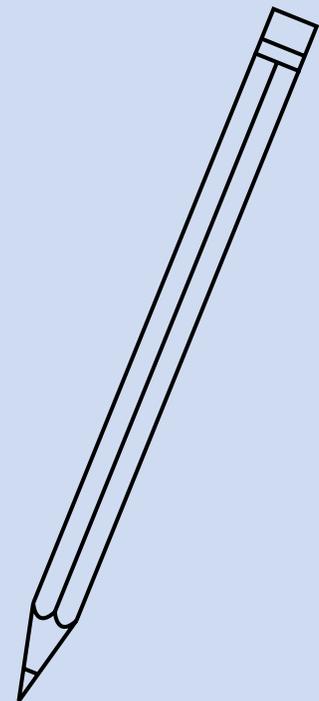# Zero Gravity

STUDY GUIDE

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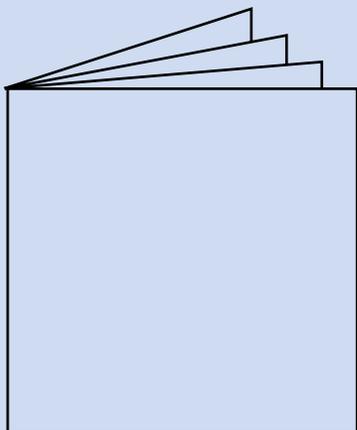
SFILM education

About the Film

Zero Gravity, Directed by Thomas Verrette, USA, 74 min

This documentary is a powerful and inspirational story about education, science, and the next generation that follows a diverse group of middle school students who compete in a nationwide competition to code satellites aboard the International Space Station. Seen through the wondrous eyes of three young innovators and their first-time coach, they each embark on an intimate and personal journey to the final frontier as their team grows from amateur coders to represent California in the ISS Finals Tournament — the culmination of a summer-long adventure that sees their incredible accomplishment performed by astronauts in orbit.

Recommended Grades: 3 – 12

Pre-Viewing Topics

Zero Gravity chronicles the Zero Robotics competition, introducing and challenging students to use computer programming to be part of a design solution for NASA. To prepare for a class screening of Zero Gravity, first ask your students to consider their own experiences with computer science. What do they know about computer science? What does computational thinking mean? How does computer science impact their daily life? What coding programs have they tried or would they like to try?

You can gain perspective of students' understanding of space exploration with the following prompts. Why do humans explore? What do you know about space? What are you curious about as it relates to space? Would you go to space if you were offered the opportunity? Why or why not?

Teaching the Film

Thomas Verrette's **Zero Gravity** is a feature documentary chronicling Campbell Middle School's Zero Robotics competition. Students are challenged to work together to design and code autonomous satellites inside the international space station to accomplish tasks relevant to future space missions. Their mission is to build surveying satellites to orbit mars, to deploy three satellite systems (SPSs), to decide as a team what to take to their assembly zone and how to protect it from their competitors. A screening of this film will complement a curriculum in STEAM subjects, specifically delving into coding and programming challenges. Central themes also exhibit teamwork, perseverance, and problem solving.

Subject Areas

- **Computer Science**
- **Math**
- **History**
- **Peer/Youth Issues**
- **Science**
- **Social Studies**
- **Women/Gender Studies**
- **Engineering**
- **Technology**
- **Career Path Training**

Presenter Bio

Thomas Verrette is an award-winning director, producer, and editor. A 14-year veteran of the film industry, Verrette is a former Fox and Disney creative and post-production executive, and is most known for producing the 20-episode World Cup docuseries, **Phenoms**, for Fox Sports. Verrette also edited the Goalkeepers episode, which premiered the series at the Tribeca Film Festival. He also executive produced the documentary feature **Ordinary Gods**, co-produced the short-comedy series **Small Shots**, and edited the sci-fi feature Parallels. Verrette began his career upon graduating from the Savannah College of Art and Design, when his senior thesis film, **Implanted**, premiered at the Atlanta Film Festival, and secured limited-theatrical, international, DVD, and streaming distribution in 2012. **Zero Gravity** is his first feature documentary as a director, and he is currently developing a sequel **Zero Gravity** series centered around the global high-school ISS competition. Additionally, he is also scripting his next narrative feature, a sci-fi thriller titled Dark Matter, and hopes to go into production at the end of 2022.

Discussion Questions

Personal Reflections

- Write about a time when you were part of a team. Describe the project and your role.
- Write about a time that you persevered through a challenge. Include details about the challenge, how you persevered through the failures and what successes you accomplished.
- Makayla tried programming for the first time because it was offered during an after school program and it sounded interesting. What type of learning opportunities do you wish you had?
- What are some life lessons that learning to code can teach?
- How can coding help contribute to improvements in your community?

Themes and Context

A way to understand something is to look at it analytically, breaking it down into parts, figuring out how it works, asking questions and trying different solutions. Describe how using analytical thinking can help when playing the game of chess or solving a complex problem?

- How do contestants earn points in the Zero Gravity coding challenge?
- What are two design parameters involved in the contest? How do design parameters influence the design challenge?
- How did the students show perseverance throughout the coding challenge?

Post Viewing Prompts

- How did the students react to coming in 5th place? What mindset did they have about the contest?
- How did Apollo 11 (1969), the Columbia Disaster (2003) or the Mars Rover Landing (2012) influence the current space missions? What two improvements have been made since these expeditions?
- What does international cooperation mean to you as it relates to space exploration?

Activities

CODING ACTIVITIES

Through coding, students use analytical skills to quickly fix programming challenges and try again in different ways. It offers a problem-solving technique that promotes learning by doing.

Prep and materials:
- Two Copies of identical lego pieces or 1 pre-built structure/1 broken down   structure that you choose (5-10 pieces)
- Some sort of privacy barrier to not see one another's designs

- Have students get into pairs.
- Choose who will be: 1) the "instructor" and 2) the "builder."
- Have the "instructor" build a lego structure (or jump to the next step if pre-built)
- Once complete, the "instructor" will inspect the legos to visually "decompose" its design
- The "instructor" will give their "builder" a set of simple instructions to help them build an identical robot. This is the algorithm.
- Ask questions, get specific, and most importantly: **No peeking**! Neither the instructor nor the builder should see each other's designs until the build is complete. If time is called before all builds are complete, use the reflection time to improve design.

Reflection questions: How did they do? Are any pieces not correct? What "bugs" were in the original algorithm? What improvements would you make to the algorithm? This is the process of debugging.

To simplify the design challenge:
- Pre build the Lego model for the "instructor"
- Simplify the amount of Legos used
- Make two copies for the builder - one to physically decompose and one as a model

Extra challenge: Throw in a variety of extra pieces that the builder does not need. How does this relate to abstraction in computational thinking? How can identifying patterns in your algorithm make building a replica of this Lego structure easier for your builder?

Activities

ONLINE CODING CHALLENGES

Engage students in practicing their programming skills with user friendly design challenges.

[Learn how to fly with Scratch](#) - with their laptop or desktop, students can follow a tutorial to get started with blockly coding commands to make their character fly. For an extra challenge, have students simulate an animation from space with various movements, characters and scenes.
https://tinyurl.com/bjvvzknz

There are a variety of free coding programs available to engage learners based on their interests. From block based coding programs to diverse programming languages, check out these resources for more options.
Online Coding Options and Resources
https://tinyurl.com/4mcmz4tt

DESIGN AND ESSAY PROMPTS

- Design an image or 3D model of a glimpse of life in zero gravity.
- Choose one of the quotes below. What does it mean to you:

"It is all based on the strategy. What is the value of each action?" –Teacher Tanner

"I think if you reach your final destination, it is not the end. You can keep going." –Advik

"I want to expand. Like ships across the seas, rocket ships that cross the galaxy." –Makayla

"When people say that the sky's the limit, I think they are wrong because there is much more ahead of them." –Carol

"No matter how many times you fall, you have to get up one more time." –Teacher Tanner

- Write a persuasive essay to convince community members to create a coding opportunity for you and your friends. Describe the opportunity you would like and why it will be meaningful to you.

Media Literacy Resources: Screening with Meaning

We live in a world where technology mediates a large portion of human interaction and the exchange of information. Every projected image, every word published on a page or a website, and every sound from a speaker reaches its audience through the language of the medium. The ability to parse the vast array of media messages is an essential skill for young people, particularly in a mainstream commercial culture that targets youth as a vulnerable, impressionable segment of the American marketplace. Many students already have a keen understanding of the languages different media use and the techniques they employ to inspire particular emotions or reactions, but they often lack the skill or awareness to fully deconstruct the messages they continuously receive. Analysis of a media message—or any piece of mass media content— can best be accomplished by first identifying its principal characteristics:

1. **Medium**: the physical means by which it is contained and/or delivered

2. **Author**: the person(s) responsible for its creation and dissemination

3. **Content**: the information, emotions, values or ideas it conveys

4. **Audience**: the target audience to whom it is delivered

5. **Purpose**: the objectives of its authors and the effects of its dissemination.

Students who can readily identify these five core characteristics will be equipped to understand the incentives at work behind media messages, as well as their potential consequences. Media literacy education empowers students to become responsible consumers, active citizens and critical thinkers.

MEDIA LITERACY STANDARDS

MEDIUM
All Media Is Constructed.
- What is the message, how is it delivered and in what format?
- What technologies are used to present the message?
- What visual and auditory elements comprise the media content?
- What expectations do you bring to the content, given its medium and format?

AUTHOR
All Media Is Constructed by Someone.
- Who is delivering the message?
- Who originally constructed the message?
- What expectations do you have of the content, given its author(s)?

CONTENT
Media Is A Language For Information.
- What is the subject of the media message?
- What information, values, emotions or ideas are conveyed by the media content?
- What tools does the author employ to engage the viewer and evoke a response?
- To what extent did the content meet your expectations, given the format/author?

AUDIENCE
**All Media Messages Reach an Audience.**
- Who receives the message?
- For whom is the message intended?
- What is the public reaction to the media content and/or its message?
- What is your reaction to the media content and/or its message?
- How might others perceive this message differently? Why?

PURPOSE
All Media Messages Are Constructed for a Reason.
- Why was the message constructed?
- Who benefits from dissemination of the message? How?
- To what extent does the message achieve its purpose?
- What effect does the message have on the audience it reaches, if any?
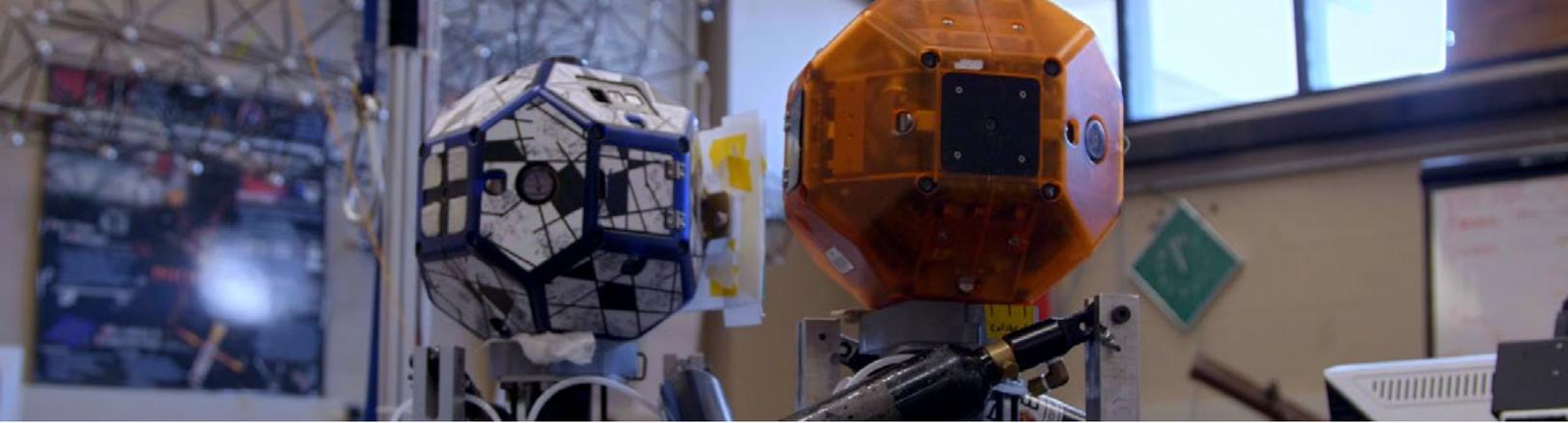
Common Core Standards

3rd-5th Grade

CCSS.ELA-LITERACY.SL.3-5.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.3-5.2
Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-LITERACY.W.3-5.8
Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

6th - 8th Grade

CCSS.ELA-LITERACY.W.6.1-8C
Write arguments to support claims with clear reasons and relevant evidence.

CCSS.ELA-LITERACY.SL.6-8.2
Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

CCSS.ELA-LITERACY.W.6-8.8
Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

9th-10th Grade

CCSS.ELA-LITERACY.SL.9-10.1
Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.SL.9-10.2
Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

11th-12 Grade

CCSS.ELA-LITERACY.SL.11-12.1
Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-LITERACY.W.11-12.8
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Documentary Guide

What is a documentary?

A documentary is a film whose goal is to capture truth, fact or reality as seen through the lens of the camera. But there are many kinds of documentaries, and not everyone's idea of truth is the same. The Scottish filmmaker John Grierson coined the term "documentary" in 1926 to describe American filmmaker Robert Flaherty's romanticized culture studies, but nonfiction filmmaking dates back to the earliest motion picture reels.

The definition of documentary expanded as filmmakers experimented with technology and the goals of nonfiction. Avant-garde documentarians, like Dziga Vertov in the 1920s, believed that the mechanical eye of the camera gave a truer image of reality than the human eye and pointed his lens at newly industrialized cities. Leni Reifenstahl's propaganda films from Nazi Germany used the nonfiction form to convey a political message, a slanted truth.

The international cinema vérité or observational movements of the 1960s attempted to remove authorship from the documentary. The observational filmmaker hovered like a "fly on the wall" watching the world without commentary. Modern documentaries often seek to raise awareness about a social, environmental or political issue, guiding their audiences toward civic participation and activism.

While watching a documentary, it is important to remember the core concepts of media analysis: who made the film, for what audience and why? The nonfiction format can be deceptively subjective, as all filmmaking involves an inherent selection process: in the images that are shot, the music and narration that accompanies them and, most significantly, the way in which they are all edited together. Media literacy means always analyzing a documentary for its message and authorial intent.

Even though they are nonfiction films, most modern documentaries structure their content around a traditional story arc, with a beginning, middle and end, as well as characters, and a conclusion, theme or thesis to impart to the audience. Documentary filmmakers begin their projects with an idea or an issue that they wish to explore more deeply. Through research and planning, they develop a comprehensive plan before they begin shooting.

A BRIEF TIMELINE OF THE DOCUMENTARY

1895 The Lumiere brothers develop the first motion picture film reel, capturing brief unedited clips of life around them called 'actualities.'

1900-1920 Travelogue or 'scenic' films become popular showcasing exoticized images from around the globe.

1926 Dziga Vertov, with the Soviet Kino Pravda movement, released the experimental nonfiction film, Man With A Movie Camera.

1939 John Grierson collaborated with the Canadian government to form the National Film Board of Canada, with the initial goal of creating Allied propaganda in the support of war.

1960s The 'cinema vérité' movement began in Europe, followed by the 'direct cinema' in the US. Portable cameras and sync sound allowed filmmakers to capture intimate footage with minimal intervention.

1968 The Argentine film, La Hora de los Hornos, opened the door to activist cinema of the 1970s, using film as a tool to counter capitalist politics in Latin America.

1988 Independent Television Service (ITVS) was founded.

2000s The widespread use of digital cameras and editing software made the documentary medium more affordable to independent filmmakers.

Present Day The term 'documentary' comes to encompass a wide range of nonfiction cinema. Contemporary filmmakers continue to push the boundaries of truth in film and to explore new avenues and applications for the medium.