

# **EDUCATORS GUIDE**

Commanding Space

This guide is geared toward teachers of grades 6 - 9.

Supported by:













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### **About This Guide**

Use this guide to help your students anticipate, investigate, and reflect upon your virtual performance experience. This guide is geared toward teachers of grades 6 - 9.

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The great thing about the arts is that they can often evolve to meet their context. That means that many of the activities shared are flexible to a lot of different contexts depending on how you choose to frame them in your class. We know that you all are experts on your classroom and your students and so we invite you to use these lessons and activities as guideposts and adapt them to fit your classroom management style, range of student ability, and time constraints.



**Educators**, we invite you to share with us what you did in your classroom around this guide or the production. You can email **offstage@portlandovations.org** or reach us via <u>Facebook</u> or <u>Instagram</u>.

We want to hear and see what great learning is happening in your classrooms.



# **Introducing the Performance**

It is often helpful to share some context with your students before they attend a live performance. Feel free to use the information below to give your students more context about *Commanding Space* at Westbrook Performing Arts Center.





# **About the Performance**

In the midst of the Civil Rights Movement, young Annie Easley knows she can be something more. In this true story of dreams, hardships, and self-determination, Annie becomes one of the first African American human computers at NASA. Initially working on airplanes, she soon realizes her destiny is to be on the team of mathematicians that launch the Centaur Rocket into the Space Race. *Commanding Space* is an important story about a persistent and intelligent woman whose desire to succeed in science and technology proved stronger than the prejudice that would have denied her.



# **About the Production**

Commanding Space was written by playwright Stephanie Leary. The play was directed by Joann Yarrow for Syracuse Stage, a theater company in Syracuse, New York. The role of Annie Easley is played by actress Erin Lockett. The costumes and props were designed by Kate Laissle and the sound was designed by Luther Masanto. Today the play tours around the country.



Erin Lockett as Annie Easley in 'Commanding Space'



# **Theater Etiquette**

An audience member is a part of a larger community – an audience – and you all work together to create your theater experience. Audience members play a special and important role in the performance. The performers are very aware of the audience while they perform. Sharing their hard work and joy with you is one of the best parts of being a performer. Each performance calls for different audience responses. Lively bands, musicians and dancers may desire audience members to clap and move to the beat. Other performers require silent focus on the stage and talking from the audience can be distracting. A theater is designed to magnify sound and even the smallest whispers can be heard throughout the auditorium. The production encourages audiences to clap and laugh at the parts of the performance that you enjoy or connect with.

As you enjoy the show, think about being a part of the performance.

- What are the differences between attending a live performance and going to a movie or watching television?
- What are some different types of live performances? How many can you name?
- What kind of responses might an audience give to different types of performances?
- What are the different cues that a performer will give you so that you know how to respond? For example, might they bow or pause for applause?



The interior of the Westbrook Performing Arts Center



# **Essential Questions**

#### Who is Annie Easley?

"When people have their biases and prejudices, yes I am aware. My head is not in the sand. But my thing is, if I can't work with you, I will work around you. I was not about to be discouraged that I'd walk away. That may be a solution for some people, but it's not mine!" – Annie Easley

Annie Easley was a groundbreaking rocket scientist, mathematician, and computer engineer who worked on the Centaur rocket project and early versions of batteries for hybrid vehicles. Annie Easley was born on April 23, 1933, in Birmingham, Alabama and was raised by a single mother. While in college at Xavier University in New Orleans, Annie got married and moved to Cleveland, Ohio. She read an article about twin sisters working as "human computers" at NACA, the National Advisory Committee for Aeronautics. She thought the job sounded interesting and the next day drove to NACA and applied for the job. When she was hired in 1955, she was one of four African Americans working for NACA out of 2,500 employees. While working for NACA (soon to be changed to NASA), Annie received her Bachelors of Science in Mathematics from Cleveland State University. As computers changed, Annie was prepared to change with them. She became a computer programmer for NASA once electronic computers were capable of reading and deciphering code to help solve obstacles that space engineers would face daily. Annie used FORTRAN (Formula Training System) and SOAP (Simple Object Access Protocol) to elevate NASA's programming. Annie retired from NASA in 1989 after 34 years of working for the organization. Annie passed away in Cleveland on June 25, 2011, at the age of 78.

Read an interview with Annie Easley about her career at NASA: https://historycollection.jsc.nasa. gov/JSCHistoryPortal/history/ oral\_histories/NASA\_HQ/Herstory/ EasleyAJ/EasleyAJ\_8-21-01.htm



Annie Easley



#### What is a human computer?

A human computer describes someone who does mathematical tasks. Today we think of a computer as an object of technology, but in 1955 a computer referred to a person "who computes" equations and calculations and troubleshoots mathematical questions and problems. Here is Annie Easley describing her job as a computer.

"When I started with NACA in 1955, our jobs were really to do the computations for the engineering side of the house. The engineers and the scientists are working away in their labs and their test cells, and they come up with problems that need mathematical computation. At that time, they would bring that portion to the computers, and our equipment then were the huge calculators, where you'd put in some numbers and it would clonk, clonk, clonk out some answers, and you would record them by hand. Could add, subtract, multiply, and divide. That was pretty much what those big machines, those big desktop machines, could do. If we needed to find a logarithm or an exponential, we then pulled out the tables and did it. We'd look up the tables and then put it in by hand. Or a square root. All those things, we had tables that we looked up. And that's why, in my lifetime, to have seen where we were and where we are, that I can have a little tiny something the size of, oh, gosh, well, my watch, practically, and it can give me all of those functions that used to take up so much space and so much time to do. And the clonk, clonk, clonk, clonk, clonk."

Jobs and tasks as computers have existed for thousands of years. These mathematical computations were needed to figure out everything from the building of pyramids in Ancient Egypt (2550 – 2490 BCE) to the astronomical study of the planets during the Shang Dynasty (1600 – 1050 BCE) in China or the Renaissance era in Europe (1300 – 1600 CE). In the 1900s, many human computers were women. "The reason that these pre-electronic computation jobs were feminized is they were seen as rote and de-skilled," says Mar Hicks, a historian and author of Programmed Inequality. It wasn't true, though: "In a lot of cases, the women doing these computation jobs actually had to have pretty advanced math skills and math training, especially if they were doing very complex calculations." (Thompson). The human computers at NACA/NASA were essential in figuring out trajectories, engineering calculations and other computations.

"At its bases, NASA employed nearly 80 black women as computers," says Margot Lee Shetterly, author of *Hidden Figures*. One of them, Katherine Johnson, was so revered for her abilities that in 1962, John Glenn asked her to personally verify the flight path of his first launch into space on the Friendship 7 mission. The astronauts didn't trust the newfangled digital computers, which were prone to crashing. Glenn wanted human eyes on the problem.

"They had a tremendous amount of respect for these women and their mathematical abilities," says Shetterly. "The male engineers often were not good mathematicians. So the women made their work possible." Still, some friction existed. Women who asked for promotions got stonewalled or turned down: "For women who wanted to move up, who wanted to be supervisors—particularly if that involves supervising men? Not so much" (Thompson).

By the 1970s, human computation was no longer necessary. Some women moved into the field of software and coding but there still remains a large underrepresentation of women in the computer and information technology fields.

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#### What is NASA?

The National Aeronautics and Space Administration (NASA) "is America's civil space program and the global leader in space exploration. At its 20 centers and facilities across the country...NASA studies Earth, including its climate, our Sun, and our solar system and beyond. We conduct research, testing, and development to advance aeronautics, including electric propulsion and supersonic flight." (nasa.gov/about).



The United States' commitment to aeronautics grew after World War I when it became clear that the country's knowledge and resources around airplane technology needed to expand. NASA was founded in 1958 after the National Advisory Committee for Aeronautics (NACA) was dissolved. The National Advisory Committee for Aeronautics (NACA) was founded as a United States federal agency on March 3, 1915. "In 1958, responding to the nation's fear of falling behind the Soviets in the utilization and exploration of outer space, Congress passed the National Aeronautics and Space Act of 1958, which formed a new civilian space agency, NASA. NACA officially turned over operations to NASA on 1 October 1958. The new agency would be responsible for civilian human, satellite, and robotic space programs, as well as aeronautical research." (https://history.nasa.gov/naca/overview.html)

#### What is the Centaur Rocket?

The Centaur Rocket is a group of rockets placed on the upper stage of a launchpad used to give the aircrafts and shuttles an added boost. The Centaur Rocket uses liquid nitrogen to fuel it's propulsion system. At the time the rocket was created, liquid nitrogen was a new fuel option. Dr. Abe Silverstein, who ran the Lewis Research Center (now the Glenn Research Center) in Cleveland, OH, convinced NASA to let his teams work on this project. In addition to working on the rocket, these teams perfected the Atlas booster. Annie Easley worked on the Centaur Rocket team. The first successful launch of the Centaur/Atlas booster was in 1963. Centaur was not to be just another booster, but the rocket by which NASA would conduct extensive Earth orbit missions, lunar investigations, and planetary studies. For the next 30 years, the Lewis Research Center teams continued to improve the booster. Today, variants of the original booster remain an important part of the power upper stage launch system.



Centaur stage during assembly. 1962



#### What was the social climate of the United States in the 1950s and 1960s?

Annie's story is very much informed by growing and living as a Black woman during the times of Jim Crow laws and the Civil Rights Movement. By the time Annie was in her early 20s, it was the mid-1950s. In 1954, the Supreme Court ruling in Brown v. the Board of Education came through declaring "separate but equal" unconstitutional, the Montgomery Bus Boycott began, and Black voters had to pass a Literacy Test to be able to vote. During the course of the play, Annie navigates her own participation in the voting rights marches, the murder of Emmett Till, the integration of Little Rock Central High School with its first nine Black students, and the assassination of President John F. Kennedy. Playwright Stephanie Leary highlights these events and uses playwriting devices including walking, a metaphor of jelly beans, blues music, and Freedom Songs to help integrate the emotions and culture of Black Americans during this time period.

Read about playwright Stephanie Leary's experience writing the play here: <a href="https://www.tyausa.org/tya-today/demanding-a-place/">https://www.tyausa.org/tya-today/demanding-a-place/</a>

#### Is there still more to learn about space?

Humans have long been interested in space - the planets, stars and universe beyond the earth's atmosphere. The first human flew into space in 1961 and the first person walked on the moon in 1969. Since then, many missions have gone into space, including the space probe, Voyager 1, which explored into stellar space 14.5 billion miles from earth, and the Mars Rover which landed on the planet Mars. However, as far as we know, the universe and space could be infinite so there is always more to discover. In July 2022, NASA received their first images from the James Webb Space Telescope. These are the most vivid and clear images that NASA has ever gathered. The photographs show entire galaxies that are over 13 billion light years away (Renstrom). NASA and other researchers also continue to learn more about our own planet, specifically the depths of the ocean that are also almost impossible to reach. Interestingly, humans know more about space than we do about the deepest parts of the oceans on earth.

First Images from the James Webb Space Telescope: <u>https://www.nasa.gov/</u> <u>webbfirstimages</u>



Carina Nebula Credits: NASA, ESA, CSA, and STScI

#### What are the elements of drama?

All art forms are made up of different elements and drama — or dramatic literature or plays — are no different. According to Aristotle (a Greek playwright and one of oldest playwrights we know of) there are six elements of drama. Plot or action, character, theme or thought, dialogue, spectacle or visual elements, and music or sound or song.

- 1. Plot or action: The what. The main action.
- 2. Character: The who. The protagonist and their relationship to other characters.
- 3. Theme or thought: The why. The psychology behind the characters' actions.
- 4. Dialogue: The how. How characters achieve what they want.
- 5. Spectacle or visual elements: The where. What we can see onstage.
- 6. Music: The rhythm of speech, the use of song and sound.



## **PRE-PERFORMANCE LESSON ACTIVITIES**

Here are some ideas for lesson activities that expand on the essential questions, topics, and themes of *Commanding Space*.

#### Glossary

plantation fields).

Share these words and proper nouns with students prior to the performance so they have a shared vocabulary and context while watching.

**AERONAUTICS:** the science or practice of travel through the air.

**ALGORITHM:** a process or set of rules to be followed in calculations or other problem-solving operations.

**BLUES MUSIC:** a genre of music that is characterized by a style of rhythm, lyric, and a few instruments including the banjo, guitar and harmonica. Historians believe that the blues originated in the American South influenced by "field hollers" (a way that enslaved Black people communicated in the

**CIVIL RIGHTS MOVEMENT:** the struggle for social justice and equal rights for Black Americans that took place in the 1950s and 1960s.

**EQUATION:** a statement where the values of two mathematical expressions are equal.

**FORTRAN (Formula Transition):** a computer programming language created in 1957 by John Backus that shortened the process of programming and made computer programming more accessible.

**LITERACY TEST:** tests Black Americans had to take before they could vote. These tests were between 1 and 40 questions and were intentionally vague and confusing. They were graded by biased white judges and one wrong answer meant the voter failed.

**LOGARITHM:** the power to which a number must be raised in order to get some other number.

**NACA:** National Advisory Committee for Aeronautics, a government agency that worked on aeronautics research.

**NASA:** National Aeronautics and Space Administration, and organization that researches and explores space.

**SPACE RACE:** a competition between the United States and Russia to see who could achieve more in space exploration first. It lasted from 1955 – 1975.

**SPUTNIK:** the first artificial satellite launched into the Earth's atmosphere. It was launched on October 4, 1957 by Russia. Its launch initiated the Space Race. **XAVIER UNIVERSITY:** a Historically Black College in New Orleans, Louisiana.





#### **Constellations**

This is a drama activity that you can use to learn more about your students. In a large space, with furniture pushed to the side, invite students to walk around the space, silently. Let them know that you are going to read a prompt and invite them to silently follow it when you say "go." These prompts ask participants to place a hand on the shoulder of someone else who meets the criteria of the prompt. A lst of prompt examples are below. Once they put their hand on someones shoulder they stop walking, at which point a constellation of connections will begin to emerge throughout the group. You can invite them to talk with their pair/groupings about something to engage conversation. That question prompt could be anything from what their favorite type of candy is to a question related to content you are learning in class. You can invite them to report out to the entire group, or not. Mix it up. Then invite them to walk silently around the space again, and give them the next instruction.

Here is a list of a few prompts to get started – and feel free to shift them as they work for your classroom.

- Put your hand on the shoulder of a person you've known a long time.
- Put your hand on the shoulder of a person you've known a short time.
- Put your hand on the shoulder of a person who you share an interest in common.
- Put your hand on the should of a person ...

Once finished, ask students to reflect on the activity. What did you notice about the group/ yourself as we played? How did it feel to choose a person? You could also have a conversation about why it might be titled Constellations. This is a great activity to use as a metaphor for how the class is connected in many ways.

For more detailed instructions, check out: <u>https://dbp.theatredance.utexas.edu/teaching-</u><u>strategies/constellations</u>

#### What to Look for When You Watch

Theater is not just about the words that are said – but how they are said and how the performers' bodies move onstage and interact with objects and the performance space. In the case of a one-person performance, pay attention to how the actor moves around the stage space. Theatrical design (sets, costumes, props, sound, and lighting) also add other layers of storytelling through visual and auditory means. With this in mind, as you are watching the performance, notice the production elements.

- The scenery and props. What are they? How are they used? How do they connect to and help tell the story?
- The lighting design. When is it dark and when is it light onstage? How does the lighting impact the moment you are watching?
- The sound design. What do you hear? When is it used? How does it create different moods throughout the play?
- The actor. How do they move their bodies? Where do they move onstage? How does their movement help to strengthen the words they are saying?









## **POST-PERFORMANCE LESSON ACTIVITIES**

#### **Capture Your Thoughts**

Directly after watching the performance, invite students to fill out the handout on page 16. This will allow them to return to those thoughts for future discussions about the piece. Feel free to add questions that connect to the topics and themes of your classroom, or any of the Discussion Questions below.

#### **Post-Performance Discussion Questions**

- 1. What was the play about?
- 2. What moments of the play stuck with you? What moments of emotion in the play resonated with you? How did the show make you feel?
- 3. What questions do you have?
- 4. What different production elements (music, lighting, costumes, set, etc.) did you notice ( in the show? How did the actress use the cubes (the pastel covered boxes) as a part of the play's storytelling?
- 5. Mr. Reed is the first to tell her that she is "different than the others." What is he talking about? How does Annie's line, "I don't fit their equation of Blackness" connect to this same idea?
- 6. How was Annie inspired by her time at Xavier University?
- 7. How did the different current events in the 1950s and 1960s impact her? What current events have impacted your life?
- 8. Annie says, there's "progress in every failure." What does this mean to you?
- 9. How did Annie choose to deal with the discrimination and racism she faced while working at NASA?
- 10. When does Annie fully come to believe that she can do anything she wants to? How do you know this?
- As a child, and all through her life, "numbers spoke" to Annie. What speaks to you?

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### situations. How do these songs make you feel? Why do you think these songs were an important part of Civil Rights music? Is music still used this way today?

**ACTIVITY: Songs of Freedom** 

"We Shall Overcome" by Pete Seeger: https://www.youtube.com/watch?v=M\_Ld8JGv56E

"I Wish I Knew What it Felt to be Free" by Nina Simone: <u>https://www.youtube.com/watch?v=-</u>sEP0-8VAow

"Ain't Gonna Let Nobody Turn Me 'Round" by The Freedom Singers: <u>https://www.youtube.</u> <u>com/watch?v=dwkomneAdyl</u>

(The guitar player in the video is Toshi Reagon, whose musical <u>Parable of the Sower</u> will be presented by Portland Ovations on April 14, 2023. It is co-written with her mother, Bernice Johnson Reagon, the lead singer.)

#### **ACTIVITY: Build Your Own Space Craft**

Using this activity from NASA, inspire students to design and build their own spacecraft. First, have them do some research on the different NASA spacecrafts for inspiration. Gather found or edible materials to make the spacecraft. When they have completed their design/build, have them label the different parts. You could even challenge them to work in scale.

https://spaceplace.nasa.gov/build-a-spacecraft/en/

Check out other activities from NASA here: <u>https://spaceplace.nasa.gov/make-do-pdf/en/</u>



#### ACTIVITY: Monologue Writing

Monologue writing is a great way to invite students to better understand different perspectives or share their own experience. In playwriting, a monologue is utilized by a character focused on trying to communicate something important. A monologue should have a listener.

Invite students to choose a person – a character in a book, a historical figure, a scientist etc. to research and write a monologue from their perspective. Make sure they also identify who the character is delivering the monologue to, and keep the text active and in the present.

Check out these in-depth handouts/resources to use with students.

https://www.theatrefolk.com/distance\_learning/Monologue%20Writing%20PLC%20Handout.pdf

Annie sings three different Freedom Songs throughout the play - "We Shall Overcome," "I Wish I Knew What it Felt to be Free," and "Ain't Gonna Let Nobody Turn Me 'Round." Listen to these songs and their lyrics and have a discussion about how music can be used in challenging











### SOURCES

Dunbar, Brian. "Centaur: America's Workhorse in Space." NASA, 7 Aug. 2017, https://www.nasa.gov/centers/glenn/about/history/centaur.html

Johnson, Sandra. "Annie J. Easley Oral History." 21 Aug. 2001, https://historycollection.jsc.nasa.gov/JSCHistoryPortal/history/oral\_histories/NASA\_HQ/Herstory/ EasleyAJ/EasleyAJ\_8-21-01.htm

Renstrom, Joelle. "What the Webb Telescope Might Tell Us about Ourselves." Cognoscenti, WBUR, 20 July 2022,

https://www.wbur.org/cognoscenti/2022/07/20/james-webb-space-telescope-nasa-climate-change-joelle-renstrom

Thompson, Clive. "The Gendered History of Human Computers." Smithsonian Magazine, June 2019, https://www.smithsonianmag.com/science-nature/history-human-computers-180972202/



**Portland Ovations**, founded in 1931, produces dynamic performing arts events including classical music, jazz, opera, dance, theater, and Broadway. We believe that cultural enrichment should be high quality and accessible to all. Ovations collaborates with other nonprofit organizations, education systems, and the business sector to promote lifelong learning while celebrating the power and virtuosity of the performing arts. We bring the exhilaration of the performing arts into our communities with free events as part of Ovations Offstage, connecting artists and audiences. Join us at unexpected "art happenings," classroom workshops, masterclasses, community discussions, and pre-performance lectures to explore together the relevance and connection of the performing arts to our lives.

#### Land Acknowledgment

Portland Ovations acknowledges that the places where we gather, dance, and sing is ancestral Wabanaki land. We wish to pay respect to the Abenaki, Maliseet, Mi'kmaq, Passamaquoddy, Penobscot – and their elders past, present and future.



Native-Land.ca

Created and written by Sarah Coleman Additional writing provided by Syracuse Stage Designed by Katie Day © Portland Ovations 2022



#### **CAPTURE YOUR THOUGHTS – Commanding Space**

After watching the performance take a few minutes to reflect on what you watched, thought and felt.

The part of the performance that grabbed my attention the most was

While watching the performance, I had the strongest reaction to

A question I have after watching the performance is

Overall, the performance made me feel

The performance made me think about

One thing I want to talk/learn more about is



### STUDENT RESPONSE FORM

We want to know what *you* thought about the performance. You can write your answers below or draw a picture on the back of this page. Thank you!

**PERFORMANCE:** Commanding Space

SCHOOL NAME:	TEACHER NAME:	GRADE:	
YOUR NAME:	May we use your name whe	en we share your comments?	
		Yes No	

What did you like about Commanding Space? Why did you like that part?

What was something that you learned during the performance?

What would you like to tell other kids about Commanding Space?

What types of performance would you like Portland Ovations to offer in the future? (Feel free to share what type of art you are interested in (theater, dance, music), what cultures you might like to see, what topics the art might connect with, or specific artists.)

MAIL RESPONSES TO: Portland Ovations 120 Exchange Street, Portland, ME 04101 EMAIL SCANNED RESPONSES TO: offstage@portlandovations.org



### TEACHER RESPONSE FORM

Please take a few moments to fill out this survey after you attend the performance. You can also fill it out <u>online here</u>. Your response provides valuable insight on the impact, accessibility, and relevancy of the School-Time Performance Series and will allow us to improve and strengthen the program. Thank you.

**PERFORMANCE:** *Commanding Space* – November 15, 2022

TEACHER NAME:	_GRADE(S) OF STUDENTS:						
SCHOOL NAME:	_CITY/TOWN:						
EMAIL ADDRESS:							
1. From your perspective as a teacher, how would you rate	Commanding Space?						
□ Excellent □ Very Good □ Good □ Fair	□Poor						
3. What made this a valuable experience for your students? (If it wasn't, what can we do better?)							
4. What was your primary reason for choosing to bring you	r students to <i>commanaing Space</i> ?						
$\Box$ I wanted my students to experience the performing arts.							
☐ The performance topic fit with my curriculum goals.							
☐ The date and time of the performance fit our schedule.							
☐ The ticket price is affordable.							
$\Box$ Other (please specify):							
5. How did this live performance connect to or enhance you	ır curriculum?						

6. Did you use the Educators Guide provided by Portland Ovations before or after attending the performance?

7. Why or why not?

8. What improvements can we make to the Educators Guide to serve you and your classroom better?



### TEACHER RESPONSE FORM

#### 9. How would you rate the following components of attending the School-Time Performance?

	Excellent	Very Good	Good	Fair	Poor
Reserving & paying					
for tickets					
Communication					
about the day of the					
performance					
Arrival at the venue					
Departure from the	Departure from the				
venue					

**10. What types of performances would you like to bring your students to in the future?** (Feel free to share art forms, topics/themes, specific artists, etc.)?

11. A number of generous individuals and organizations make it possible for Portland Ovations to offer these School-Time Performance tickets at extremely discounted rates. Is there anything you'd like them to know in terms of your experiences or its impact on your students?

MAIL RESPONSES TO: Portland Ovations 120 Exchange Street, Portland, ME 04101 EMAIL SCANNED RESPONSES TO: offstage@portlandovations.org