Hedy Lamarr's Double Life

Hollywood Legend and Brilliant Inventor

A teacher's guide created by Marcie Colleen
based upon the picture book biography
written by Laurie Wallmark and illustrated by Katy Wu

Published by Sterling Children's Books

"A must for both school and public libraries." — *School Library Journal*
"Revelatory to young audiences in more ways than one." — *Kirkus*
"Part picture book biography and part tech primer." — *Publisher's Weekly*

Laurie Wallmark
Author, ***Hedy Lamarr's Double Life***

Award-winning author Laurie Wallmark's debut picture book, *Ada Byron Lovelace and the Thinking Machine* (Creston Books, 2015), received four starred trade reviews (*Kirkus, Publishers Weekly, Booklist,* and *School Library Journal*) and many national awards including Outstanding Science Trade Book and Cook Prize Honor Book. Her picture book biography, *Grace Hopper: Queen of Computer Code* (Sterling Children's Books, 2017), earned a *Kirkus* star, is a Parents' Choice Gold Medal winner, and is on several public libraries' "best of" lists, including New York. Laurie has an MFA in Writing for Children and Young Adults from VCFA. You can find Laurie on the Web at http://www.lauriewallmark.com/ and @lauriewallmark.

Katy Wu
Illustrator, ***Hedy Lamarr's Double Life***

Katy Wu has a BFA in Illustration and Entertainment Arts from Pasadena Art Center College of Design and has worked for Google, Laika, Pixar, CinderBiter, and Simon & Schuster. *Grace Hopper: Queen of Computer Code* was her first picture book. Katy lives in New York City. Follow her online at http://katycwwu.tumblr.com/.

Marcie Colleen
Curriculum Writer

This guide was created by Marcie Colleen, a former teacher with a BA in English Education from Oswego State and a MA in Educational Theater from NYU. In addition to creating curriculum guides for children's books, Marcie can often be found writing picture books of her own at home in San Diego, California. Visit her at www.thisismarciecolleen.com.

How to Use This Guide

This classroom guide for *Hedy Lamarr's Double Life* is designed for students in first through fifth grade. It is assumed that teachers will adapt each activity to fit the needs and abilities of their own students.

It offers activities to help teachers integrate *Hedy Lamarr's Double Life* into English language arts (ELA), mathematics, science, and social studies curricula.

All activities were created in conjunction with relevant content standards in ELA, math, science, social studies, art, and drama.

Aligned for Grades 1-5 in both Common Core ELA and Math, and Next Generation Science Standards

1st grade: CCSS: ELA.RL.1.1,2,3,5,7; RI.1.1,2,3,4,6,7,8,9; W.1.2,3; SL.1.1,2; L.1.1,2,4; MATH: 1.OA.3, 1.MD.4

NGSS: 1-PS4-1,4; K-2-ETS1-1,2,3

2nd grade: CCSS: ELA.RL.2.1,3,5,6,7; RI.2.1,2,3,4,6,8,9; W.2.1,2,3; SL.2.1,2,5; L.2.1,2,3,4; MATH: 2.OA.1

NGSS: 2-PS1-2; K-2-ETS1-1,2,3

3rd grade: CCSS: ELA.RL.3.1,3,4,7; RI.3.1,2,3,4,6,7; W.3.1,2,3,4,7,8; SL.3.1,2,3,4,5; L.3.1,2,3,4; MATH: 3.OA.1,3; MD.2

NGSS: 3-5-ETS1-1,2,3

4th grade: CCSS: ELA.RL.4.1,2,3,4,6; RI.4.1,2,3,4; W.4.1,2,3,4,7; SL.4.1,2,5; L.4.1,2,3,4; MATH: 4.OA.1,5

NGSS: 4-PS3-2; 4-PS4-1,3; 3-5-ETS1-1,2,3

5th grade: CCSS: ELA.RL.5.1,2,3,4,6; RI.5.1,2,3,4; W.5.1,2,3,4,7; SL.5.1,2,5; L.5.1,2,3,4; MATH: 5.OA.1,5

NGSS: 3-5-ETS1-1,2,3

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English Language Arts

Reading Comprehension

Before reading *Hedy Lamarr's Double Life*

Look closely at the Front Cover ~

- Describe what you see.
- Who do you think the woman is? Why do you think Katy Wu illustrated her in two halves?
- When do you think this story takes place? Today or a long time ago? What clues on the cover tell you this?
- Can you guess what the story might be about? What are some clues that tell you the setting?

The Endpapers~

- Read the poem aloud. (It is to be read across, not down.)
- Read the list of words associated with an Actor. Can you think of five more words to add to the list?
- Read the list of words associated with an Inventor. Can you think of five more words to add to the list? Bonus: rhyme the Actor words with the Inventor words to continue the poem.
- The question "Who was the real Hedy Lamarr?" implies that someone cannot be both an inventor and an actor. Do you agree or disagree? Explain your answer.

Now read or listen to the book.

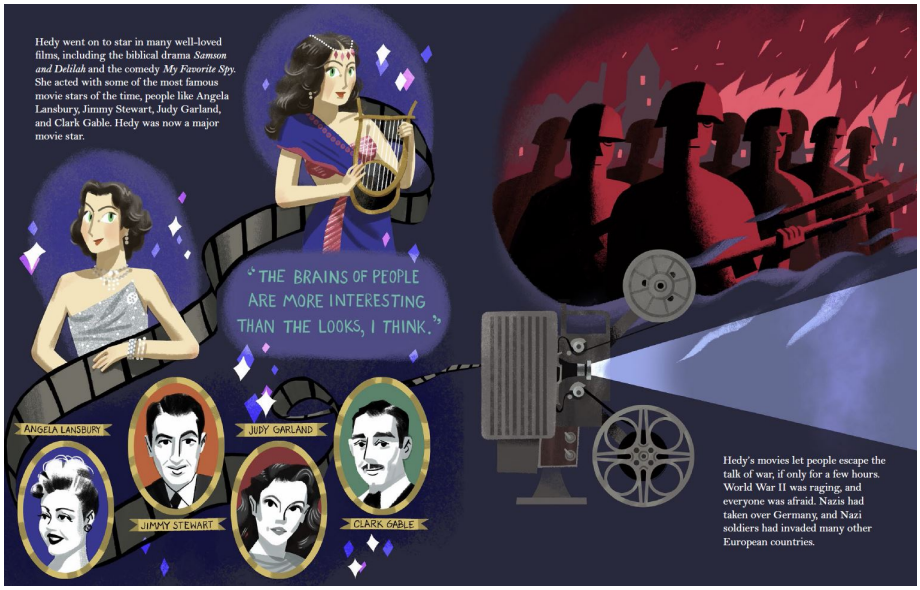
Help students summarize in their own words what the book was about.

- What does the phrase "double life" mean? Describe in your own words.
- Name at least two of Hedy's inventions. What was considered her greatest invention?
- How was Hedy as a very curious child?
    - Do you ask a lot of questions? What would you like to know more about?
    - In what ways did Hedy's father encourage her curiosity?
- Hedy Lamarr said, "I acted all the time…I was a little living copybook. I wrote people down on me." Explain what she might have meant in your own words.
- Hedy Lamarr was a movie star during World War II, the Golden Age of Hollywood. Why did many people escape to the movies during this time?

- Most inventors and scientists start with a question. What was the question Hedy Lamarr asked George Antheil?
- What gave Hedy the idea for the secure torpedo guidance system?
- Explain Hedy's "the hopping of frequencies" in your own words.
    - How did George's previous experience with player pianos help with the development of the Secret Communications System?
- Hedy wanted to help America win the war, but the Navy passed on her Secret Communications System and marked the patent SECRET. What other ways did Hedy find to help in the war effort?
- Why did Hedy Lamarr and George Antheil never receive credit for the frequency-hopping technology that is used widely today?
    - Name some of today's technology that is made possible today because of Hedy and George's work.

Let's talk about the people who created *Hedy Lamarr's Double Life.*

- Who is the author?
- Who is the illustrator?
- What kind of work did each person do to make the book?



Now, let's look closely at the illustrations.

In the style of Katy Wu,

- Compare the style that Katy Wu used to illustrate *Grace Hopper: Queen of Computer Code* with the style used in *Hedy Lamarr's Double Life.*
    - What are some similarities?
    - What are some differences?
    - Why do you think Katy Wu chose the styles she did for each book?
- Research some of the posters from Hedy Lamarr's movies.
- Create your own Hedy Lamarr poster, but instead of advertising a movie, advertise Hedy's inventions.
- Display the finished posters in the classroom.

Reading Nonfiction

While reading *Hedy Lamarr's Double Life* aloud to the class, have students take notes in two columns:

- *Things We Learned*
- *Questions We Have*

Pause before each page turn to add notes to the columns. These columns can either be individual or put on the smartboard and worked on as a class.

Things We Learned (Facts)	Questions We Have	Answers We Found

- Once the story is read, discuss the *Questions We Have* column.
  - Were any of these questions answered as the story went along?
  - If so, ask students to find the answer within the text.
  - Record the answer next to the question in a third column labelled *Answers We Found.*

- For all remaining questions in the *Questions We Have column*, that have yet to be answered, students will need to take the steps to find answers, either through Internet or book research.
  - Discuss how to find answers to questions through research.
  - Assign students to specific questions to help them focus.
  - Record all answers in the *Answers We Found* column.

- After the answers have been shared with the class, engage in a discussion on research practices.
  - What was the most difficult part about finding answers?
  - Was it easier to find answers on the Internet or in a book?
  - Which source is more reliable, the Internet or a printed book? Why?
  - How can you determine whether to trust a source?
  - What tips would you give someone who is about to do research?

- Read the information, including timelines, at the back of the book.
  - Create an additional chart to document what information in the back matter was included in the story and what information was not included.

- Why do you think Laurie Wallmark chose to include certain information and leave other information to the back matter?
- Choose three facts from the back matter and explain why you think each was not included in the story.

Extension: Design and illustrate posters representing each Fact, Question, and researched Answer based on *Hedy Lamarr's Double Life* and display them within the classroom.

Writing Activities

But Wait! There's More: Writing a Persuasive Essay

Hedy and George needed to present their invention to the National Inventors Council to have it considered for military use. This presentation included a description of the invention and probably how it could help the military. At times like these, a little persuading can help.

Ask your students if they know what "persuade" means. If not, can they make any guesses?

Discuss:

- What it means to persuade

- Times you might want to persuade someone (e.g., persuade your parents to let you stay up late, persuade your teacher to not give a test)

Writing to persuade tells the reader: what you believe; gives the reader at least three reasons why you believe it: and has a good ending sentence. You want to try and convince the reader to agree with you.

Have students pretend to be Hedy Lamarr and write a persuasive essay describing one of Hedy's inventions and why it should be produced. Use the following TREE structure:

T = Topic sentences	The topic sentence tells the reader about the invention. Example: *I am writing to you because I have an invention that will change the way the world looks at tissue boxes.*
R = Reasons	The reasons why this invention should be produced. Write at least two to four sentences supporting each of the three reasons. Use evidence directly from the text.
E = Ending	The conclusive sentence wraps everything up, summarizing your reasons.
E = Examine	Read over your essay. Do you have all your parts? Revise, if necessary.

Share your essays with the class. Which is the most persuasive? Why do you think so?

Quotable Lamarr

Laurie Wallmark included several of Hedy Lamarr's quotes throughout *Hedy Lamarr's Double Life*.

Have students choose one of Hedy's quotes and write a four-paragraph essay about what this quote means to them.

Speaking and Listening Activities

Picture books are written to be read aloud. Here are some other ways to bring *Hedy Lamarr's Double Life* to life in your classroom and have fun with speaking and listening skills!

Choral Reading

- Turn *Hedy Lamarr's Double Life* into a script. Read the script out loud together. Emphasize memorization of the students' parts as well as good vocal expression.

Mime

- While the teacher reads the book aloud, students can act out the events in the book. Emphasize body motion and facial expressions, as well as listening skills.
- To practice acting, Hedy Lamarr would mimic "the way people walked and talked. She copied their mannerisms and facial expressions." Pick a partner and take turns observing each other and attempting to adapt each other's movement.

Drama

- Create a Flipgrid or PowerPoint presentation to encourage people to read *Hedy Lamarr's Double Life.*
- Create an infomercial for one of Hedy Lamarr's invention.

Language Activities

Techno-Vocabulary

Hedy Lamarr's Double Life contains many "technology and engineering-related" words which may be new for students. Encourage them to use context clues from both the text and illustrations to infer meanings.

hackers	improve	design	exchanged	construct(ed)
frequency	communicate	device	patent	spectrum

Additional Exploration:

- While they read, ask students to look carefully for words they do not know. As soon as they come across a new vocabulary word, they should jot it down.
- Look up the unknown word in the dictionary. (Depending on the level of your students, a student volunteer can do this or the teacher can.) Read the definition.

- Come up with a way to remember what the word means. Using Total Physical Response, students can create an action that symbolizes the word and helps them remember it.

Math

Create a Secret Communication Code

Hedy and George created a secret way to communicate with launch torpedoes. Your students can create their own secret communication using numbers!

With a lined sheet of paper, create two columns with a long vertical line. In one column write the letters A-Z, one letter per line.

Then in the other column, number 1-26. The numbers do not need to be in order, but each number can only be used once. Each one of these numbers will correspond with a letter.

For example:

A	5
B	3
C	7
D	4
E	2
F	1
G	6
H	8

Duplicate the list and give to your friends.

Write a secret note using numbers instead of letters. Students will be able to "decode" and translate your message by using the letter that corresponds to the number on the key.

Math Without Numbers

Inventors and engineers use math skills every day, even when they don't use numbers. These skills are important to anyone who is thinking critically and solving problems.

Help your students practice with the following activities:

Classifying and grouping games: Mixing many kinds of blocks and ask students to classify them by size, color, or shape. Older children can classify and group themselves based on birthday months, color of clothing, etc.

Estimation: Using dried beans and several containers of different heights and widths, students are to guess which containers will hold the most beans and which containers will hold the least beans. Have students put the containers in order according to their capacity. Once the class has agreed on the order, fill each container with beans, one at a time. Count how many beans are in each container. Were they right about the order?

Patterning: Build a simple pattern using M&Ms, buttons or pieces of paper. Start with an alternating pattern (called an AB pattern): one red candy, one green candy, one red, one green, and so forth. Be sure to repeat the pattern at least once. Next, students should continue the pattern by building a sequence that's exactly like the initial pattern. "How did you know to start with a red?" or "Why did you use a green here?" Some more difficult patterns to practice are: AAB, ABB, AABB, and ABC.

BONUS:

- How do you think classifying and grouping, estimating, and patterning assist inventors like Hedy Lamarr?
- How would you use these skills in your daily activities?

Science

Sound and Communication

Hedy and George created a "frequency-hopping" communications system. Now, using simple science, students can experiment with sound and communication, too.

Hedy's system didn't actually contain numerous walkie-talkies. Instead, it used a single device that could quickly change frequencies. As long as the device on the ship and the one on the torpedo were tuned to the same frequency at the same time, they could communicate. Hedy called her discovery "the hopping of frequencies."

Hedy and George spent night after night brainstorming ways to implement her idea.

Frequency hopping was the most important part of the guidance system they developed. Even if the enemy managed to overhear part of a message, it didn't matter. The device had already hopped to a new frequency. Unless the enemy knew the frequency being used at an exact moment, they couldn't interfere with the message.

Slinky Sound Waves

This activity uses a slinky to illustrate the nature of sound waves.

Place a slinky on the floor and have a student hold each end. One student slides the slinky back and forth.

A disturbance is created within the slinky by the back and forth movement of the first coil of the slinky. The first coil becomes disturbed and begins to push or pull on the second coil. This push or pull on the second coil will displace the second coil from its position. The second coil moves the third coil and so on. Subsequently the disturbance travels through the slinky.

Like all waves, a sound wave has a frequency. A frequency is the number of times a sound source vibrates in a given unit of time, like a second. Have the students move the slinky faster and slower. They can see how the number—or frequency—of waves between the two ends changes depending upon their speed.

Frequency determines pitch. Pitch is the highness or lowness of sound. Create a low frequency wave with a slinky by moving it slowly, and create a high frequency wave by moving it rapidly.

Amplitude is the energy in a sound wave. Students can try to simulate what high and low amplitude waves look like with their slinky by sliding the end of the slinky different distances. High amplitude sounds are made by objects that vibrate with a lot of energy, like the sound of rocket blasting off. Low amplitude waves are like a whisper, where our vocal cords vibrate lightly to make sound waves.

Paper Cup Telephone

Each student will need the following supplies to build a basic paper cup telephone:

- 6 feet of string
- 2 paper cups
- a paper clip (Use paper clips that are about 1 inch long, NOT jumbo clips. You'll be bending the paper clips, and coated ones are easier to bend.
- a pencil

Make a hole in the center of the base of both cups, using the pin.

Tie one paperclip to one end of the string.

Pull the other end of the string through the hole in one of the paper cups. The paperclip should be inside the paper cup.

Insert the free end of the string into the hole in the bottom of the second paper cup. Insert it from the outside of the cup.

Pull enough string through the hole to enable you to tie the second paperclip to the end of the string.

Pull the cups apart so that in each cup the paperclip rests flat on the floor of the cup and the string is taut.

Take one cup, and have a friend take the second cup. Walk away from each other until the string is taught you're now ready to use your paper cup phone.

Use the following questions to spark discussion.

1) How do you think the paper cup telephone works?
2) Draw and describe what happens to the sound as it goes from cup to cup.
3) How could you change your paper cup telephone to make it better?

Your students will also have the chance to come up with their own experiments with the phone. The list below shows materials they could use. You can get more materials if you like.

- More paper cups, including larger and smaller cups
- construction paper that could be used to make a cup larger
- ribbon, yarn, dental floss, or other kinds of string
- more of the same string you used before
- more paper clips

Invent-a-Challenge

This challenge allows students to problem solve a way to improve a common household item! Of course, a little imagination is going to go a long way here, too!

- Inspired by Hedy Lamarr's tissue box design, choose a household item for students to "improve upon."
- Explain to students that they will be working in groups of 2-3 to re-design and re-imagine the item.
- Provide the students with several craft items (rulers, paper, cardboard tubing, empty boxes, tape, glue, etc.) Check the recycling for other ideas of materials.

- Students should create a scientific notebook for their invention and carefully document everything they did during the process of designing and building it.

Once all the inventions have been created, test them out one by one as a class. Did they work? Retest? If they didn't work, head back to the drawing board like a real inventor.

Offer up awards to increase the competition.

  - Most Useful Invention
  - Most Unique Invention
  - Most Attractive Invention
  - Most Materials Invention
  - Least Materials Invention
  - Silliest Invention

Necessity is the Mother of Invention

Today, inventions do so many things we take for granted.

Lead students in creating a list of some of the machines or inventions that make our daily lives easier.

- Who invented these machines? When?
- If you could invent something, what would it be?

Have students design inventions and create a Flipgrid or PowerPoint presentation demonstrating what it can do and convincing others to buy it.

Social Studies

Famous Female Inventors

Assign a famous female inventor for students to research in the library and on the Internet. A list of 10 are below, but do not feel limited to those on the list.

- Margaret Knight
- Melitta Bentz
- Caresse Crosby
- Katharine Burr Blodgett
- Stephanie Kwolek
- Ada Lovelace
- Bette Nesmith Graham
- Mary Anderson

- Ruth Wakefield
- Marion Donovan

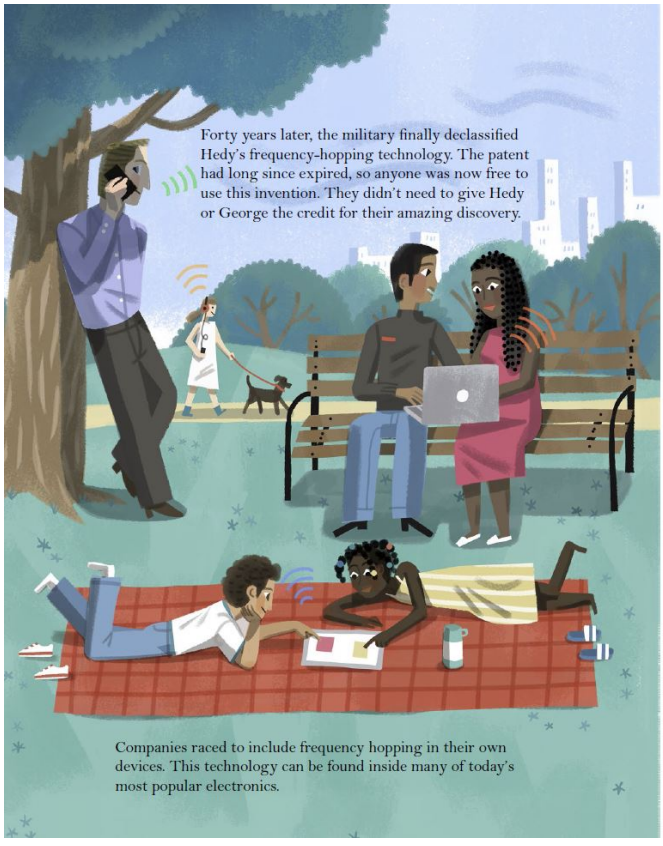
Possible sources for information:

- Nonfiction books
    - *Girls Think of Everything: Stories of Ingenious Inventions by Women* by Catherine Thimmesh, illustrated by Melissa Sweet (Houghton Mifflin 2000)
- Library research
- The Internet

Take notes and gather as much information as possible on the following five topics about your inventor:

- Early Life/Childhood/Family
- Life as an inventor
- Famous work
- Legacy
- Other fun facts

Once the information is gathered, work to create either an illustrated poster or booklet of the findings.



Frequency-hopping spread spectrum is the technology that helps keep cell phone calls and texts private. It's the trick that allows secure wireless communications between computers and the Internet. And it makes it harder for people to hack drone aircraft.

All this was made possible by Hedy's idea, "the hopping of frequencies."

Gender Bias in Science

We hope students today realize that girls can do and be anything boys can. But, bias still exists in the science, technology, engineering, and mathematics fields.

While we rarely recognize biases within our own thinking, this activity, adapted from www.smarttutorcom, will raise consciousness and spark discussion.

1. Ask children to draw a picture of a scientist. They may not ask any questions to you or any of their peers. They must simply draw the first scientist that comes to their minds, with no talking or sharing.
2. Then, students should create a brief written description of who their scientist is and their scientist does.
3. Ask them to share their drawings and descriptions with the class.
4. While students are sharing, chart the number of male and female scientists that students create on a graph. Do not reveal what you are doing to avoid skewing the results.

Discuss the results. Often children draw mostly male scientists in lab coats with chemicals or something of the sort. Share the graph with the students. Do the results show an internalized gender bias? Challenge the class to discuss where they feel this bias comes from and why it is harmful to society.

Use Hedy Lamarr's experience in *Hedy Lamarr's Double Life* as an example.

- How have the STEM fields changed for females since Hedy's time?
- How have they stayed the same?
- How can we take steps to end gender bias in the sciences?