



ART &
SCIENCE
COLLIDE

HUMANS & ARTIFICIAL INTELLIGENCE

HIGH SCHOOL | ART & SCIENCE STANDARDS-ALIGNED

ESSENTIAL QUESTION

How do culture and imagination intersect in our interactions with artificial intelligence?



Sensing the Future: Experiments in Art and Technology (E.A.T.) at Getty Center

All Watched Over by Machines of Loving Grace at REDCAT (Roy and Edna Disney | CalArts Theater)



Counter/ Surveillance: Control, Privacy, Agency at the Wende Museum

Future Imaginaries: Indigenous Art, Fashion, Technology at the Autry Museum of the American West



In partnership with

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LA PROMISE
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ESSENTIAL QUESTION

How do culture and imagination intersect in our interactions with artificial intelligence?

DISCUSSION

Explore the essential question with students using the exhibition images, descriptions, and student discussion prompts provided for each exhibition.

Then, transition from talking about the exhibitions to connecting them thematically through these prompts:

1. Both artists and engineers make decisions about how to use technology to create a product. How do you think artists' and engineers' decision-making processes might be similar? How might they be different? What criteria do you think each group considers when they are making their decisions?
2. How do you think cultural biases or expectations might shape the way we interact with artificial intelligence (AI)? How might those biases or expectations shape the way AI responds? Can you think of any possible examples?
3. How might AI contribute to the creative processes of artists and engineers? What might be some limitations of those contributions? Should AI be treated as a collaborator? If so, under what circumstances?

CLASSROOM ACTIVITY

Overview

In this project, students will work independently or in teams to create and analyze AI-generated images of technologies developed throughout history. Students will iteratively practice writing AI prompts from multiple points of view, comparing and contrasting the results.

Learning Outcomes

As a result of this activity, students will be able to...

- Define a problem and articulate criteria, constraints, and values for its solution.
- Create and iteratively refine an AI prompt to generate images representing diverse perspectives on selected technologies.

Suggested Materials

- AI image generator (e.g., Adobe's openart.ai or any other tool)

Instructions

STEP 1: Choose a technology and research its history. Encourage students to think broadly as they choose their technologies. Examples could range from facial recognition and artificial intelligence to early agricultural and fishing technologies. Identify basic information about the technology: When and where was it developed? By whom? Who are/were its users?

STEP 2: Take multiple points of view. Prompt students to identify and discuss multiple points of view on the development of their chosen technology, identifying at least two contrasting perspectives on it.

- Who would have been involved in the development of this technology? Who would have been affected?
- From each point of view, describe the problem that the chosen technology was intended to solve. What were the constraints and criteria? Whose points of view were taken into account in the development of the technology? Whose might have been left out?

STEP 3: Write, run, and refine. For each chosen point of view, students write and refine a prompt that describes the problem, outlines the criteria and constraints from each contrasting point of view, and asks the AI image generator to show potential solutions to that problem without explicitly naming the chosen technology. Once students have drafted the prompts, use openart.ai or another image generator to run the prompts, analyze the resulting images, and iteratively refine the prompt as needed.

STEP 4: Select, reflect, and share. After iteratively generating their images, students choose those that best represent the solutions from the contrasting points of view they identified and reflect on the following prompts as they share with the class:

- What technology did you choose, and whose points of view did you represent? What were some similarities and differences in the criteria and constraints from those points of view?
- How did you choose which images ultimately represented their points of view? What evidence of their criteria or constraints did you find in the images?
- How do contrasting priorities in these points of view shape the criteria, constraints, and technological solution? How might this shape the way we, as humans, envision the solution to a problem? How did it shape the way AI envisioned the solution?

Optional Extensions

Integrate this lesson with English language arts to analyze the grammar, syntax, and structure of AI prompts.

Additional Resources

Title	Source	Description
Become an AI whisperer with these 12 image generator prompts	Adobe	Tips for writing effective prompts for AI image generators. Includes multiple contrasting examples.

[AI Image Generation Tools](#)

Massachusetts Institute of Technology (MIT)

Definitions, tips, and recommended tools for AI image generation.

[Project Zero's Thinking Routine Toolbox: Considering Controversies, Dilemmas, and Perspectives](#)

Project Zero at Harvard University

Repository of prompts for reflection and discussion to guide students' explorations of multiple perspectives on a single issue or event.

[The Autry's Collections Online](#)

Autry Museum of the American West

Search for fishing and agricultural artifacts.

[Science and Technology Records](#)

U.S. National Archives

Repository of historical archives in science and technology.

[How AI is cropping up in the agriculture industry](#)

Forbes

This article describes how the agricultural industry is using AI to decrease waste and increase productivity.

[How AI can impact agriculture](#)

National Future Farmers of America Organization

This article lists the benefits of AI in agriculture and how farmers are using it to support a global food system.

Assessment Checklist

To assess students' artistic and scientific learning, consider the following questions:

- Did students select at least two contrasting perspectives on the development of their chosen technology?
- Was the problem reasonably defined from both of these perspectives?
- Did students iteratively refine their AI prompts?
- Did students link differences in the AI-generated images to the contrasting perspectives they represented in their prompts? Did they do so by referencing concrete evidence they observed in the AI-generated images?

VOCABULARY

Art Terms

Term

Definition

image generator

A computer program or system that makes an image, with or without referencing a written prompt.

generative art

Type of art in which humans write the code or rules to guide a computer system's process of generating creative content, often in an iterative process.

Science Terms

Term	Definition
artificial intelligence	Computer systems that can perform tasks that would usually require human intelligence, including understanding language, finding patterns, learning, making decisions, and others.
problem statement	A description of the need, desire, or issue to be solved.
constraints	Factors that limit what can be done in the engineering and design process.
criteria	Requirements that the designed product must meet.
concept generation	The process of coming up with ideas that might solve the problem, considering the constraints and criteria of the problem.
iterate	To make multiple attempts, usually with improvements made each time.

ART & SCIENCE STANDARDS

California Arts Standards

This **media arts** project aligns with two Anchor Standards:

- **Creating — Anchor Standard 1: Generate and Conceptualize Artistic Ideas and Work** under the process component **Conceive**
- **Connecting — Anchor Standard 11: Relate Artistic Ideas and Works with Societal, Cultural, and Historical Context to Deepen Understanding** under the process component **Relate**

Standard	Description
MA:Cr1	Strategically utilize generative methods to formulate multiple ideas, and refine artistic goals to increase originality in media arts creation processes.
MA:Cn11a	Examine in depth and demonstrate the relationships of media arts ideas and works to various contexts, purposes, and values, such as markets, systems, propaganda, and truth.

Next Generation Science Standards (NGSS)

This project aligns with standards in **engineering and technological science**.

Performance Expectations

Standard	Description
HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Related Practices & Concepts

SEP-1 Asking Questions and Defining Problems

Connections to Engineering, Technology, and Applications Of Science: Influence of Science, Engineering, and Technology on Society and the Natural World

California Environmental Principles & Concepts (EP&C)

The California Environmental Principles & Concepts (EP&C) build environmental literacy around the relationship between humans and the natural world. The EP&C were developed in 2004 and incorporated into California's Education Code in 2018.

Principle I: The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Human lives, communities, societies, and activities (e.g., agriculture, fisheries, and industry) depend on and benefit from the biodiversity of Earth's natural systems.

The biodiversity of natural systems influences the quality, quantity, and reliability of the ecosystem goods and ecosystem services that human lives, communities, societies, and activities depend on.

The availability and reliability of the ecosystem goods and ecosystem services that natural systems provide humans are directly affected by the size and growth of human populations, and their consumption rates, as well as the operation of human communities.



FEATURED EXHIBITIONS

This resource guide integrates four PST ART exhibitions:

- *Sensing the Future: Experiments in Art and Technology (E.A.T.)* at Getty Center
- *Counter/Surveillance: Control, Privacy, Agency* at the Wende Museum
- *All Watched Over by Machines of Loving Grace* at REDCAT (Roy and Edna Disney | CalArts Theater)
- *Future Imaginaries: Indigenous Art, Fashion, Technology* at the Autry Museum of the American West

Learn more about these exhibitions in the following pages and at <https://pst.art>.



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Sensing the Future: Experiments in Art and Technology (E.A.T.) at Getty Center



Robert Breer's "Floats," 1970 outside a model construction of the Pepsi-Cola Pavilion. Chromogenic process. Photograph by Shunk-Kender. ©J. Paul Getty Trust. Getty Research Institute, Los Angeles and Robert Breer.

About the Exhibition

Sensing the Future: Experiments in Art and Technology (E.A.T.) tells the story of a unique mid-twentieth century collaboration between artists and engineers. In 1966 American avant-garde artists Robert Rauschenberg and Robert Whitman teamed up with Bell Labs engineers Billy Klüver and Fred Waldhauer to form a new non-profit organization, Experiments in Art and Technology (E.A.T.). E.A.T.'s debut event, 9 Evenings: Theatre and Engineering, integrated art, theater, and cutting-edge technology at the 69th Regiment Armory in Manhattan and served as a launchpad for artistic experimentation. Its second major event, the Pepsi-Cola Pavilion in Osaka, Japan (1970), presented a multi-sensory environment for the first international exposition to be held in Asia. Throughout, E.A.T. spawned collaborations among artists and engineers that had a significant impact on the mid-century interplay between art and science. This exhibition deepens our understanding of multi-media art in the 1960s and 70s and examines the ways in which E.A.T. pushed the role of the artist beyond the art world. By exploring projects within the community and in the environment, as well as cross-cultural communication, E.A.T. stood decades ahead of its time.



Discussion Prompts for Students

- Why do you think artists and engineers wanted to collaborate? What do you think they had in common? How might they have been different?
- What kinds of “experiments” do you think these artists and engineers conducted together? What kinds of questions or topics might they have explored? What do you think they hoped to achieve?
- If you were part of a team of artists and engineers, how would you approach the collaboration? What kinds of problems would you want to explore and solve together? How would you incorporate scientific inquiry and evidence in your creative process?



**Counter/ Surveillance: Control, Privacy, Agency
at the Wende Museum**



QSL Card HA5HM, c. 1978. Paper. Wende Museum.

About the Exhibition

Sophisticated surveillance technologies are ubiquitous today, but the concerns they raise about privacy and government control are not new. *Counter/ Surveillance: Control, Privacy, Agency* traces the historical roots of modern surveillance devices, the Cold War dynamics that shaped and spread them, and the ways artists have reclaimed agency by critically and creatively responding to—or evading—these technologies. In the 19th century, French criminologist Alphonse Bertillon pioneered identification techniques that prefigured the proto-biometric methods of the Cold War: facial recognition, forensic portraiture, and fingerprinting. Innovative surveillance devices such as miniature cameras and bugs were the stuff of real-life espionage dramas; and by the early 1960s facial recognition was computerized. Along with activists and dissidents, many of those surveilled were artists who then developed creative responses to authoritarian oversight. The exhibition presents an overview of Cold War-era surveillance practices using historical artifacts and artworks from the Wende Museum and other collections, including facial recognition training materials used by East German border guards in the 1970s and 1980s.



Discussion Prompts for Students

- Technology is designed to meet needs or solve problems in society. What needs are being met by surveillance and facial recognition technology? What problems do these technologies aim to solve?
- Who benefits from these technologies? At whose expense? Who is targeted by these technologies?
- Imagine that you were asked to help develop some new facial recognition software. What ethical issues would you consider as you set the criteria and constraints for the project?



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All Watched Over by Machines of Loving Grace
at REDCAT (Roy and Edna Disney | CalArts Theater)



“Listener,” 2018, Kite. Performance in Linz, Austria. Includes floor projections, audio channels, and hair-braid interface. Photo by vog.photo. ©Kite.

About the Exhibition

In 1967, Caltech poet-in-residence Richard Brautigan imagined a coming future “where mammals and computers / live together in mutually / programming harmony.” Borrowing its title from Brautigan’s poem, *All Watched Over by Machines of Loving Grace* addresses one of the most pressing issues of our time—the impact of artificial intelligence—by proposing alternative directions for its future and the definition of what it means to be human. Presenting a broad range of multidisciplinary art forms, including visual art and performance, the project looks to new models of AI proposed by BIPOC, feminist, non-western, and non-binary systems of thought. How can these innovative and diverse conceptions of technology and intelligence reclaim AI’s potential? *All Watched Over by Machines of Loving Grace* expands public understanding of artificial intelligence by delving into the pressing questions it presents across underrepresented communities, exploring how technology alters the understanding of the human and nonhuman connection, and investigating its potential as a liberative tool.



Discussion Prompts for Students

- How might AI challenge our beliefs about what it means to be “intelligent”? To be human?
- What societal need or desire do you think AI is designed to meet? Whose needs or desires do you think have mattered most in decisions about the development of AI? Whose perspectives might be missing?
- If you could redesign AI, whose needs or desires would you make sure to consider?



Future Imaginaries: Indigenous Art, Fashion, Technology
at the Autry Museum of the American West



"Three Sisters," 2022, Cara Romero. Archival digital print. Courtesy the artist. ©Cara Romero.

About the Exhibition

Future Imaginaries explores the rising use of Futurism in contemporary Indigenous art as a means of enduring colonial trauma, creating alternative futures, and advocating for Indigenous technologies in a more inclusive present and sustainable future. More than 50 artworks are on display, some interspersed throughout the museum to create unexpected encounters and dialogues between contemporary Indigenous creations and historic Autry works. Artists such as Andy Everson, Ryan Singer, and Neil Ambrose Smith wittily upend pop-culture icons by Indigenizing sci-fi characters and storylines. Wendy Red Star places Indigenous people in surreal spacescapes wearing fantastical regalia, and Virgil Ortiz brings his own space odyssey, *Revolt 1680/2180*, to life in a new, site-specific installation. By intermingling science fiction, self-determination, and Indigenous technologies across a diverse array of Native cultures, *Future Imaginaries* envisions sovereign futures while countering historical myths and the ongoing impact of colonization, including environmental degradation and toxic stereotypes.

Revolt 1680 / 2180 is a part of *Future Imaginaries*. In 1680 the Pueblo revolt began. Decades before, Spanish colonizers had ravaged the landscape and decimated the Indigenous Pueblo population. Led by Po'pay, the members of this historic uprising were successful in expelling the colonizers from their homelands, and

for twelve years after freeing themselves, the Pueblos of New Mexico lived free from Castilian rule and influence. In 1692, the Spanish returned with a vengeance and stole the lands again. In *ReVOlt 1680 / 2180*, a contemporary retelling of this history by visionary Cochiti Pueblo artist Virgil Ortiz, the 1680 rebels will have more resources and aid, and their territories will be secure once and for all. For more info visit theautry.org/Revolt

Discussion Prompts for Students

- Why do you think these artists have juxtaposed Indigenous technologies with science fiction?
- We often think of technology as meeting a current need, desire, or value. What Indigenous needs or desires are met by existing Indigenous technologies? What values do these Indigenous technologies represent? Why do you think the artists have imagined these futuristic Indigenous technologies alongside them?
- How might we use technology to reimagine the past? How would you design technologies for an unknown future?

Other Related Exhibitions

In addition to the Featured Exhibitions listed above, check out these PST ART exhibitions with related themes:

- *Cyberpunk: Envisioning Possible Futures* at the Academy Museum of Motion Pictures
- *Out of Site: Survey Science and the Hidden West* at the Autry Museum of the American West
- *Future Tense: Art, Complexity, and Uncertainty* at the Beall Center for Art + Technology
- *Remote Sensing: Explorations Into the Art of Detection* at the Center for Land Use Interpretation and the Desert Research Station (DRS)
- *Sangre de Nopal/Blood of the Nopal: Tanya Aguiñiga & Porfirio Gutiérrez en Conversación/in Conversation* by the Fowler Museum at UCLA and Museum of Contemporary Art Santa Barbara (MCASB)
- *Digital Witness: Revolutions in Design, Photography, and Film* at the Los Angeles County Museum of Art (LACMA)
- *ARTEONICA*: Art, Science, and Technology in Latin America Today* at the Museum of Latin American Art (MOLAA)
- *A Veiled Gazelle - Intimations of the Infinite and Eternal* at the Museum of Jurassic Technology
- *Science Fiction Creates the Future: Public Programming* by The New Children's Museum
- *Invisibility: Powers and Perils* at Oxy Arts
- *Views of Planet City* at the Southern California Institute of Architecture (SCI-ARC)
- *Art and the Internet in LA* by the UCLA Department of Design Media Arts presented at Human Resources, Chinatown
- *Embodied Pacific* by UC San Diego Visual Art in partnership with Birch Aquarium at Scripps Institution of Oceanography
- *Digital Capture: Southern California and the Pixel-Based Image World* at UCR ARTS at the University of California Riverside

To learn more about these exhibitions and PST ART: *Art & Science Collide*, visit <https://pst.art>.