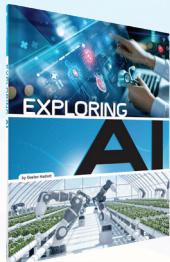


EXPLORING

AI

Educator's Guide

ABOUT THE BOOK



Explore the world of artificial intelligence and the amazing impact it is having on daily life. Discover how people are using artificial intelligence to try to solve issues with health, the environment, endangered animals, and more! A collaboration with the International Society for Technology in Education (ISTE), this book features an engaging narrative and dynamic photos that explore the creators of today's AI and those who will be taking it into the future—like you!

International Society for Technology in Education (ISTE), this book features an engaging narrative and dynamic photos that explore the creators of today's AI and those who will be taking it into the future—like you!

- Supports ISTE Student Standards
- Inspires learners to see the potential of AI
- Promotes critical thinking and problem-solving using digital tools

ABOUT THE AUTHOR



Gaeleen Hadlett is co-founder of Sunset Spark, a nonprofit where he teaches computing and science skills to new American families. He has more than 15 years of experience as a software engineer, where he has built educational, medical, and media software and digital games used by people around the world. He has 15 years of experience teaching creative technology in public school classrooms and has taught more than 10,000 students. He loves designing robots and games with his kids. He holds a B.S. and M.S. in computer science from the University of Central Florida.

I AM A DIGITAL EXPLORER

ISTE STUDENT STANDARDS

EMPOWERED LEARNER

Students use technology to set goals, work toward achieving them, and demonstrate learning.

INNOVATIVE DESIGNER

Students solve problems by creating new and imaginative solutions using a variety of digital tools.

KNOWLEDGE CONSTRUCTOR

Students critically select, evaluate, and synthesize digital resources into a collection that reflects learning and builds knowledge.

GLOBAL COLLABORATOR

Students strive to broaden their perspective, understand others, and work effectively in teams using digital tools.

DIGITAL CITIZEN

Students understand the rights, responsibilities, and opportunities of living, learning, and working in an interconnected digital world.

CREATIVE COMMUNICATOR

Students communicate effectively and express creatively using different tools, styles, formats, and digital media.

COMPUTATIONAL THINKER

Students identify authentic problems, work with data, and use a step-by-step process to automate solutions.

To view the ISTE Student Standards in full, visit iste.org/standards/students



QUESTIONS FOR DISCUSSION

BEFORE READING

1. What is artificial intelligence (AI), and how do you think it can be useful in your daily life?
2. What examples of AI have you seen before? What movies, books, or TV shows contain examples of AI?
3. How long ago do you think scientists and mathematicians started working on AI?
4. Think about the devices and gadgets you use every day. How do you think AI could make them even better?
5. Why do you think people want to use AI to help with making us healthier, taking care of the Earth, and protecting endangered animals? What good things do you hope AI can do for these issues?
6. What do you think of AI? Why do you think it is something that teachers and parents sometimes worry about?

AFTER READING

1. Share some examples you learned of how AI helps people. How do you think AI is making life better for us? What are some other ways we might use AI to help people in the future?
2. Do you think AI can help make the Earth a cleaner and healthier place? Why or why not?
3. Can you explain how AI can help discover things about history or old artifacts? What's the coolest thing you learned about this?
4. What effect does AI have on learning for you or other kids your age?
5. What do we need to remember about AI to make sure we use it in the right way?
6. What can humans do that AI cannot? (Yet!)
7. What will our world look like in 20 years? 50 years?

EXTENSION ACTIVITY

ANIMAL GUESSING GAME

In this activity, students play an animal guessing game by thinking of an animal and using an AI tool that will try to guess the animal.

For an unplugged alternative, students can work in pairs where one student is the AI and asks questions to guess their partner's animal.

ISTE Student Standard

1.3. Knowledge Constructor

d. Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

1. Have the class identify an animal.
2. Using an AI game called [Akinator](#), have the students ask it to guess the animal.
3. Have the class answer the following questions:
 - How many questions did Akinator ask before guessing the animal?
 - Was the guess correct?
 - Were the questions clearly stated and easy to answer?
 - Did you notice any patterns in the way questions were asked?

Beluga Whales and AI

Beluga whales have been endangered since 2008. Scientists know underwater noise pollution, along with climate change, affects the whales' habitat and population. Scientists at the National Oceanic and Atmospheric Administration (NOAA) are using AI to help keep track of them and monitor their behavior.

Over time, the whales' habitat near Alaska has become a busy shipping and fishing route, which creates a lot of underwater noise. NOAA scientists place underwater microphones in the beluga whales' habitat to analyze the noise. Scientists have been digitally recording underwater sounds in this way for years. Analyzing the sound recordings is difficult and takes a long time. Six months of recordings can take two weeks for humans to analyze. Since the recordings are digital, analyzing the data takes just a few hours with AI.



Beluga whales use sounds to communicate with each other.

To come up with a machine learning model, data scientists needed to create a training dataset with many underwater sounds. They had to collect sounds for different kinds of boats, whales, and other sea creatures. Then a machine learning algorithm was trained to identify only beluga whale sounds. Scientists use those sounds to keep track of the whales living in the area and easily notice any changes in their numbers.



Recording underwater sounds

Whose Face Is That?

AI designers have created technology to recognize the faces of lemurs, giraffes, and other endangered animals. The algorithms work like the algorithms for human facial recognition. But instead of using human faces in the training data, they use faces of the animal species that are being studied. AI designers make models for different animal species, and the models pick up on the unique features and differences of each animal's face.

Typically, scientists put trackers on animals to identify each individual animal. These wearable trackers, like GPS bracelets, bother wildlife and often break. Instead, cameras can be set up around animals' habitats. This way, scientists can track the endangered species using animal-facial recognition without interfering with the animals.

EXTENSION ACTIVITY

TIC-TAC-TOE

In this online activity, students will share a laptop or tablet with a partner to explore AI in action.

1. Ask students if they play Tic-Tac-Toe, who they like to play with, and who normally wins.
2. Tell them about a **Tic-Tac-Toe** game that has been programmed with five rules for an AI to follow.
3. Give students an opportunity to play several games against the AI and request that they track how many times the AI wins, how many times they win, and how many times the game ends in a tie.
4. Ask them if playing Tic-Tac-Toe is a task the AI did well. Explain that this is an example of an AI trained to do one specific task, and point out that usually an AI can do one specific task very well.

ISTE Student Standard

1.1. Empowered Learner

d. Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies, and are able to transfer their knowledge to explore emerging technologies.

CHAPTER 3

AI Uncovers the Past

Archaeologists learn about the past by studying artifacts. Artifacts are objects made by people long ago. Archaeologists along with computer scientists are using AI to preserve human history.

What's That Artifact?

Archaeologists dig up pieces of ceramic artifacts. These ancient objects are called potsherd, or sherd for short. Some are more than a thousand years old.

Without the help of AI, identifying sherd can take archeologists a long time.

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Much of archaeologists' time is spent researching and identifying the sherd. They look at artifacts in books and research catalogs to find a match. Doing this research takes a lot of time. Archaeologists discovered a way for AI to help them. They worked with AI designers to develop digital tools that can recognize and categorize new sherd found around the world.

ArchAIDE, a set of apps and AI tools, uses machine learning AI. Most of the data needed for their dataset was in paper catalogs. To create the dataset, researchers made a digital copy of every photo and text printed in the catalogs. The AI model trained on the digital photos and descriptions.

Archeologists at a dig site use technology to identify and keep track of artifacts they uncover.

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EXTENSION ACTIVITY

WHAT'S A DATASET, AND GETTING ORGANIZED

In this unplugged activity, students will get a sense of how a dataset is used to teach an AI to recognize and classify things. For a similar activity that requires less setup and a computer, have students try the Google experiment [Quick, Draw](#), which uses a dataset of doodles to identify objects as you draw them.

ISTE Student Standards

- 1.3. Knowledge Constructor
 - b. Students evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources.
- 1.5. Computational Thinker
 - b. Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
 - d. Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Setup:

Prepare 50 vocabulary picture cards (45 that fall within one general category, e.g., transportation, furniture, animals, food; and 5 representing items that do not belong in that general category). These may be purchased online or at school supply stores, or you can make them yourself using images available on royalty-free sites such as [Pics4Learning](#) or [Pixabay.com](#). Arrange the cards on a large table or on the floor so the class can see them.

Steps:

1. Ask students to look at the images and think about what overall category most of them represent. For example, cards showing things like bicycles, cars, boats, and trucks could represent the dataset *kinds of transportation*.
2. Have students decide on the overall category and explain their thinking. If students notice the 5 cards that do not fit the general category, set them to one side, but leave them next to the other cards because they are still part of the dataset for now.
3. Explain to students that 50 cards can be hard to work with all together, but would be easier to use if grouped into smaller categories. Ask them to look at the cards again and think of ways the cards could be classified into smaller groups by assigning a label to each card. In this example, you might suggest they could use labels like *things that travel on land*, *on the sea*, or *in the air*. Classify the cards using these labels. Ask students: Is it easier to get a good idea of what kinds of cards are in the dataset when the cards are organized this way, instead of in one large group?
4. Ask students to review the steps they took to name the entire dataset and then to identify labels. Challenge them to name other labels they might have used. In this example, they might have used *things that have wheels* and *things that do not have wheels*. Or, they might have labeled the cards with types of public transportation and private transportation. There are many possibilities!

EXTENSION ACTIVITY

EXPERIMENTING WITH SENSORS

In these activities, students will experiment with three types of sensors that AI robots can use to perceive the world using image, voice, and touch recognition.

ISTE Student Standards

- 1.1. Empowered Learner
 - c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
- 1.4. Innovative Designer
 - a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.

Activity 1: Image Recognition

1. Give students a chance to experiment with an AI-powered image recognition application like Google's **Semi-Conductor**, which uses a webcam to see a person's movements, then analyzes and maps out the position and movement of the person with a neural network, and finally responds by having an orchestra play accordingly.
2. Discuss the map of the movement on the screen and ask students what the AI is seeing.

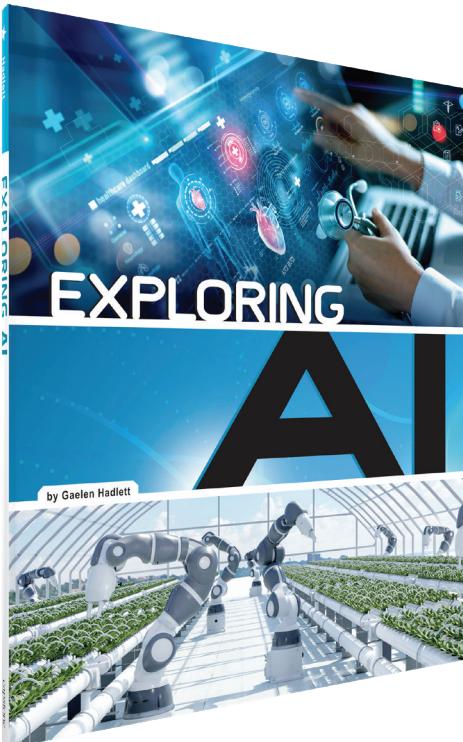
Activity 2: Voice Recognition

1. Have students experiment with an AI-powered sound or voice application, such as **Speechnotes**, which listens to the student speak, uses natural language processing for speech recognition, and displays what the user said in text on the screen.
2. Discuss the output on the screen and ask students how accurate the AI was at hearing and understanding the user.

Activity 3: Touch Recognition

1. Have students try an AI-powered touch-sensitive application like **Magic Sketchpad**, which uses a neural network to predict the rest of the user's doodle. Encourage students to draw what the AI is expecting as well as things it does not expect.
2. Discuss the accuracy of the mapping as well as the AI's guess about what would happen next in the doodle.

ADDITIONAL RESOURCES



- The jump start guide **AI in the Classroom: Strategies and Activities to Enrich Student Learning** provides tips and guidance on how to navigate AI in education and teach students what they need to know about this quickly evolving topic. With this guide, you'll explore a variety of AI technologies that have incredible potential to impact teaching and learning, and discover strategies for designing and implementing AI lessons and projects that empower students as creative communicators, innovative designers, and digital citizens.
- Check out the **ISTE Student Standards** to learn how to empower student voice and ensure that learning is a student-driven process.
- The free **Hands-On AI Projects for the Classroom guides** from ISTE and GM provide elementary, secondary, elective, and computer science teachers with innovative curricular resources about AI across various grade levels and subject areas. Each guide includes background information and four student-driven projects that directly relate to subject area standards, while providing foundational learning on what AI is, how it works, and how it impacts society.
- In the ISTE U course **“Artificial Intelligence Explorations and Their Practical Use in Schools,”** you’ll learn to identify the various types of AI, hear about AI technologies on the horizon, and build some of your own tools to make AI concrete and accessible for you and your students. No coding experience or previous knowledge of AI is required for this 15-hour, self-paced course.