AI for Children

Artificial Intelligence Curriculum for Elementary and Secondary Schools

Robots with Their Heads in the Clouds

Data & Cloud

04

npi National Pedagogical Institute of the Czech Republic

We create methodologies in cooperation with the National Pedagogical Institute.

Teachincg material for Elementary Schools–AI in Computer Science

Data & Cloud – Robots with Their Heads in the Clouds

Concept

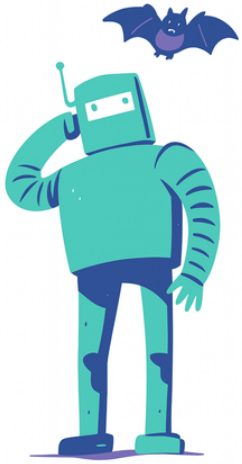
Hoo and Ray sometimes drift off with their heads in the clouds–and when they do, they start to see all sorts of unexpected things they can learn from. We humans call these things data. They can take the form of images, texts, videos, audio recordings, or even 3D objects. Often, this data is stored in what's called the cloud.

Robot Hoo

Hoo is programmed as a curious and slightly unsure robot. He always tries to understand others. He also collects various human artifacts he finds online–rare memes or old internet trends. He then shows them to Ray, who sees no value in them.

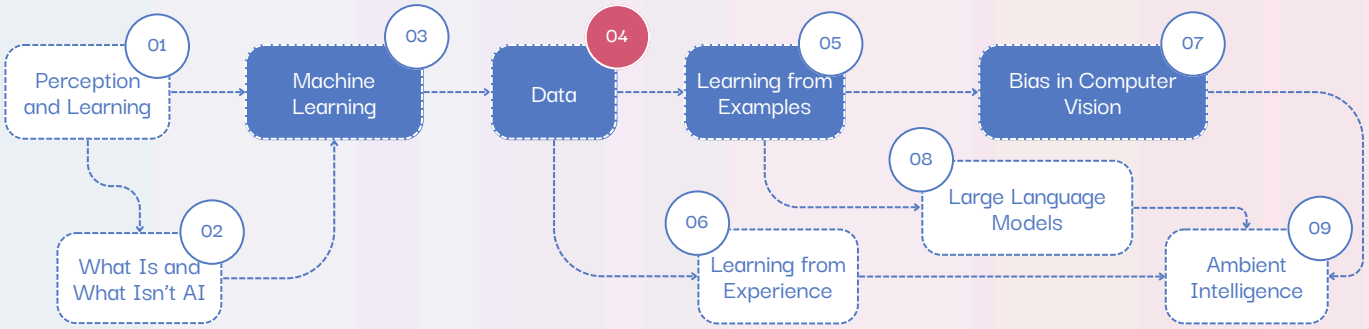
Robot Ray

Ray is programmed for practicality. He constantly looks for ways to process data efficiently. Human emotions don't interest him –what matters are the numbers. He always generates fast and accurate responses, though he often takes things too literally. Ray spends his time building complex mechanical models.



Learning progress map

The Learning Progress Map outlines the key concepts that children should understand during elementary school. The most essential ones are marked in solid blue, while the recommended concepts are shown in white. Each concept is accompanied by a teaching material and a presentation.



All materials can be found at kurikulum.aidetem.cz/en.

Presentation | Editable template in Canva | Feedback form

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Last update: 01/2025
Version: 06

These teaching materials were translated using ChatGPT.
Please note possible imperfections in the expressions or wording.

Glossary of terms

Artificial Intelligence (AI)
THere is no single, universally accepted definition of artificial intelligence.
However, all definitions agree that it refers to a system that simulates human thinking and behavior.
AI usually takes the form of a computer program designed to solve tasks that once required significant human intelligence and were considered the domain of humans (or animals).
It is also a scientific field, with roots dating back to the first half of the 20th century, focused not only on understanding intelligent systems, but above all, on creating them.

Data
Data are general pieces of information that can be used to solve various problems, make decisions, or understand the world around us. When we assign meaning or significance to data, they become information.

Computers and other devices work with digital data. These describe certain aspects of the real world around us in a form suitable for computer processing.

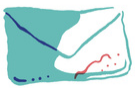
We can think of data as, for example:
1. Texts (names, words, numbers...)
2. Tables
3. Images (photographs, drawings, charts, graphs...)
4. Video multimedia – a combination of image and sound, for example, a vacation recording, an animated story...
5. Audio (voice recordings, music...)
6. 3D objects (for 3D printing, built objects in games...)

Information
In the context of data, information is their explanation (interpretation). Information arises when data are organized and used in a way that makes sense. Thanks to information, we can better understand the world and make the right decisions.

Internet
The internet is a global network that connects millions of private, public, academic, business, and government networks, either through cables or wirelessly. It enables data transfer between computers around the world, which makes communication, information sharing, and access to various content easier.

Cloud
Thanks to the internet, we can access the so-called cloud. The cloud is a place on the internet where we can store files, such as photos or documents, and access them from any device connected to the internet. It also allows us to use various online programs without needing to install them on our own computer. Examples of cloud services include Google Disk, Canva, or Microsoft OneDrive.

Lesson Overview



Recommended Age, Lesson Length
Children aged 8-11, 45–90 minutes.

Building Blocks
Data, cloud.

What Are the Students Learning?
The cloud is a place on the internet where we can store things like photos, videos, and documents, instead of keeping them only on our computer or phone.

Why Are They Learning This?
Based on their knowledge of data types and ways of sharing them, students will be able to use digital devices appropriately for their age.

How Do We Know They Have Learned It?
They name different types of data and explain the concept of the cloud in their own words.

Tools
Teacher: Printed worksheet, presentation for projection.
Students: Writing tools as needed.

Digital Competence
Communication and Collaboration.

Bloom's Taxonomy
Understanding: Students explain the concept of the cloud and describe different types of data, demonstrating their understanding of key concepts related to data.
Applying: Students practically apply their knowledge of data by collecting and creating examples in two formats based on selected words.
Analyzing: Students analyze different types of data linked to selected words in order to identify their characteristics and relationships.

Five Big Ideas
3-C-II Datasets (Large datasets).
3-A-II Nature of Learning (Finding patterns in data).

Note: Gender equality is key for AI for Children, but for brevity we use masculine formulations in our methodologies.

Engage

min 00

Presentation slide 01

Read this part of the story to the students.

Hi there! It's us again, your metal buddies Hoo and Ray – or HooRay, as some of you like to call us!
You might remember that our last adventure trying to understand your world didn't go exactly smoothly.
But who gives up after just one failure, right? We, as top-notch technology, are always upgrading ourselves!

The world around us is full of objects so tiny we can't even see them, all the way up to planets and galaxies… and also people, animals, plants, and the relationships between them. There's just so much information in the world that it can really make your head spin. And we, Hoo and Ray, are doing our best to understand and absorb it all so we can be better helpers to you. But sometimes it's really tough! No one can remember everything! Sometimes it's necessary to write things down, take a photo, record a video, or make a drawing. What about you – how do you manage your human memory?

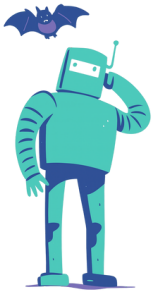
Think of a vacation or trip you've been on. How do you preserve memories of it? Are they photos, videos, or maybe notes from the trip? How are these records different from your personal memories? Think about how often you return to them and where you or your loved ones keep them.

We often call records like photos or videos "data." What else might that include?
Note: Children often perceive data as "being connected to the internet." It's helpful to explain that data can also be pictures, videos, sounds, texts, numbers, tables, 3D objects… – all stored in digital form.

Where do you think such data actually live? Where is the photo you take with your phone stored?
Children often see it as saved in the device, but many are also aware that it's often backed up online automatically.

And what about when you watch a video on YouTube? Is it on your phone or tablet?
No, it's on the internet, and thanks to your phone or tablet, you can watch it there.
Note: Understanding where data physically exists is often challenging for children.

Follow-up engaging question:



Pick up an object around you and try to say what kind of data a robot would need in order to learn something about it. You can describe the object – for example, its color, shape, size – but also things like how it smells or might taste, what it feels like to the touch, etc. At the same time, think about what form you would use to pass this information on to the robot.
Encourage children to take a photo of the object, record it on video from all sides, describe it in text, measure it, and record this information – for example, by entering it into a table, creating a 3D model on the computer, recording what sounds it makes, and so on.
Remind them that all these digital records are called data.

Note: Try this activity if you want to use devices in the classroom.

Understand

min 10

Presentation slide 02

Continue with the story.
Something was off that day. Hoo knew it the moment he woke up–not because of an alarm clock, but because of a **bark**. Not the woof of a dog, but the scratchy crackle of tree bark beside his pillow, flaking like it had something important to say. Startled, Hoo sat up and rubbed his eyes. Was he dreaming?

Meanwhile, in the garage, Ray was frozen in panic. "There's a **bat** in here!" he shouted into the hallway. He stared at the shadowy corner behind the workbench, expecting wings to flap out at any second. But as the lights flicked on and his vision cleared… he realized it was just an old baseball bat leaning against the wall. Ray scratched his head. "No wings… huh."

Later, Hoo sat in the living room with his headphones. "I'm in the mood for some **rock**," he mumbled and went to the speaker. But the music wouldn't start. Ray passed by and, hearing him, disappeared into the garden. A moment later, he returned–straining under the weight of a giant rock. "You said rock," he huffed, arms wrapped around a giant gray rock.

But things got only got stranger. Alone in the kitchen, Ray heard a sudden shout from Hoo: "**Duck**!"
He jumped to the window, scanning the sky for birds. But all he saw was a paper plane gliding lazily down the stairs –until it whacked him in the forehead. "Ow," he muttered, holding his head.

Later still, Hoo was fixing a picture frame. "Could you bring me a **nail**?" he called out. Ray appeared proudly and held up his finger. "Freshly cleaned," he said, pointing to his fingernail. That was the last straw…

In their digital world, everything was supposed to be logically organized and predictable… and now they found themselves in the middle of something far beyond their understanding. "What's going on?" Hoo shook his head. "Could it be… some kind of glitch? A system error?" Ray was trying to make sense of it.

At that moment, a light blinked on Ray's antenna. He turned to Hoo. "Looks like we're suddenly connected to the cloud! Before, we only had data in our tin heads–and now we've gained access to a huge amount of other data. That's why everything seemed to be… mixed up!"

Hoo's eyes lit up as he recalled the day's nonsense. "Wait, wait… back when I heard the word 'bat' from you, I thought you meant of the flying kind that hides in caves. But now I see it can also be something you swing to hit a ball! And bark? I kept hearing it like a dog, but it was just tree bark, flaking and crackling…"

Think back to what has happened in the story so far. Have you noticed any words similar to bark? Any that have multiple meanings?
Match (sports event, small wooden stick for making fire), seal (ocean mammal, tool for closing containers), bark (sound made by a dog, outer layer of a tree), mug (street theft, container for hot drinks), letters (symbols used in writing, messages sent by post).

Can you think of other words that have more meanings?
Possible answers: Bat (flying animal, object used in sports), spring (season, coiled metal part), wave (gesture, motion on water), wave (gesture, motion on water).

Activity

Presentation slides 03–06

min 20

Children create a "data portfolio."

The children are divided into groups, and each group chooses one word with multiple meanings (preferably tangible ones, since for example, "saw" as a verb in the past tense is harder to describe than the tool). They can draw inspiration from a story or come up with their own ideas. Their task is to collect diverse types of data for the two meanings of the same word. Although they'll be working with a paper worksheet in this activity, it's good to help them realize that these are also data for robots (i.e., digital data).

As seen in the worksheet, the children need to create these types of data for both meanings of the word:

- A text description (for example: what it's used for, where it can be found, how it works, what it's made of...)
- A drawing or photo (printing it out would be ideal)
- Properties such as color, size, material, smell, taste...
- A description of sounds associated with the meaning

Children then present their "data portfolios."

Reflect

min 40

Presentation slide 07

Continue with the story.

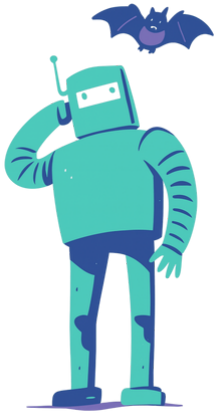
After a long day full of confusion and sorting through new knowledge, Hoo and Ray finally came to a stop. They sat next to each other, thinking about all the strange experiences they'd had and watching the changing clouds floating above them.
"You know, Ray," said Hoo, "I used to think all the data was just in our heads. But now I see that on the internet – in the cloud – there's so much more of it." Ray nodded, "...and that data is really diverse, like pictures and sounds and descriptions... and from all that, we robots are able to learn!" Hoo nodded eagerly. "Thanks to being connected to the cloud, we have all that information stored," the two robots said excitedly.
And if robots could smile, they definitely would have.

But what exactly is the cloud?
The cloud is a place on the internet where we can store things like photos, videos, and documents, so we don't have to keep everything just on our phone or computer. Imagine it like a huge flying suitcase that runs all the time and travels wherever you go – and you can put things in it or take things out anytime, as long as you're connected to the internet. It's a space on the internet that stores data and is accessible from anywhere.

In today's story, Hoo and Ray gathered a lot of data and realized that the world around them is much richer because of it. Artificial intelligence can use machine learning to learn from this kind of data. What kinds of data are we talking about? Can you think of specific examples?
– Types of data: images (photos, illustrations...), text (digital books, articles...), videos (like those on YouTube), sounds (spoken words, music...), 3D objects, or even tables.

Robots and computers learn from data, so people no longer have to prepare it all themselves, like we did today. Where do people get this kind of data?
Possible answers: people take photos, write texts, create tables, draw pictures... even though today, many of these things are already generated using artificial intelligence.

HELP THE ROBOTS UNDERSTAND WHAT DATA THEY FOUND IN THE CLOUD!



The cloud is a place on the internet where digital data is stored – like pictures, videos, tables, sounds, text documents... and the robots can suddenly see them all! But they need your help.

WRITE THE WORD YOU CHOSE HERE

Describe one meaning of the word (in text).

Describe the second meaning of the word (in text).

Draw the first meaning of the word.

Draw the second meaning of the word.

Write down the various properties in the table.

Write down the various properties in the table.

Describe the sounds that are associated with the meaning.

Describe the sounds that are associated with the meaning.