



AI for Children

Artificial Intelligence Curriculum for Elementary and Secondary Schools

Robots in the Museum

What Is and What Isn't AI

02



npi | National Pedagogical Institute
of the Czech Republic

We create teaching materials in cooperation
with the National Pedagogical Institute.

Teaching material for Elementary Schools–AI in Computer Science

What Is and What Isn't AI– Robots in the Museum

Concept

Artificial intelligence is a computer program that is capable of performing tasks that previously required human ingenuity. It is invented by humans and started a long time ago – 70 years ago! In what things is artificial intelligence hidden and how do we recognize it?

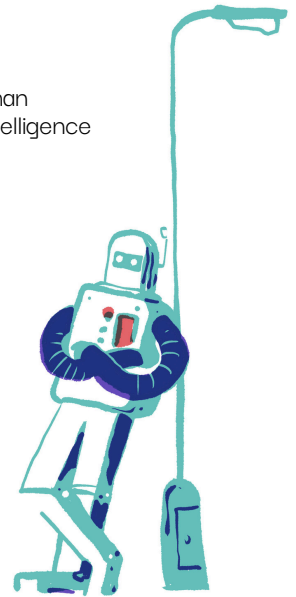
Robot Hoo

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.



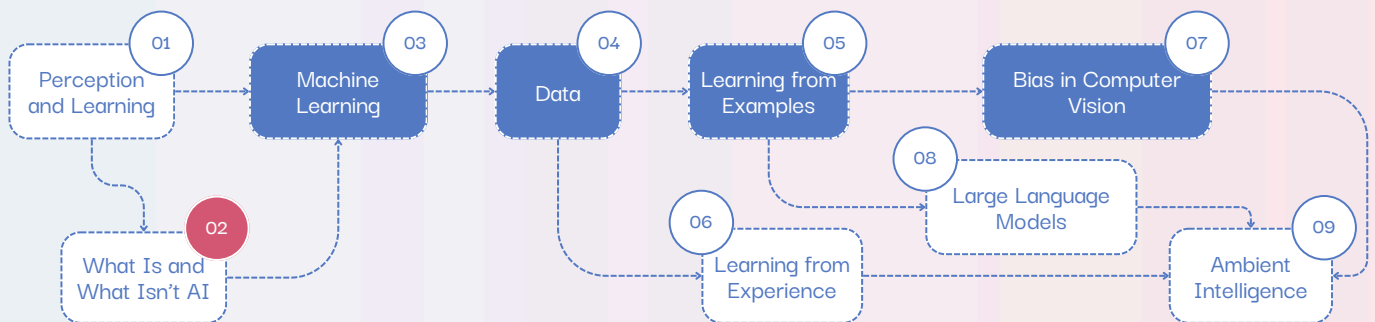
Robot Ray

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 aikurikulum.cz/en.

Created by: Bára Karpíšková
 Methodology concept: Eva Nečasová
 Expert guarantors: Cyril Brom, Zbyněk Filipi, Tomáš Mlynář, Pavel Kordik
 Artistic design: Jindra Janiček
 Proofreading: not yet done
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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.

AI in our everyday lives

Recommending content in search, on social media or on streaming platforms (Netflix, Spotify...).

Suggests the most suitable route (Google navigation, Waze).

It translates from one language to another (DeepL...).

Sometimes predicts the weather (Meteoradar...).

It generates texts, images, videos... (ChatGPT, Midjourney...).

Simplifies life with voice assistants (Siri...).

Sorts mail in the inbox based on user interactions.

Enhances games, for example in the form of intelligent agents.

Personalises some ads and online commerce (Amazon...).

Corrects the texts you write (Google Docs, Office 365...).

Technology, modern technology

Technology is generally the application of scientific knowledge for a practical purpose. It can be things, devices, or systems developed to facilitate or improve human activity. Examples include flint, printing, or the steam engine.

Modern technology is a set of advanced technological tools, systems, and processes that have been developed in the recent past. It may include innovations in information technology, robotics, bioengineering, nanotechnology, and other fields that are rapidly evolving and changing the way we live and work.

Intelligent behavior

Intelligent behavior is the ability of an organism or artificial system to respond to changes in the environment or situation in an adaptive manner that adjusts to achieve a specific goal or task. If we consider machines to be intelligent, they can learn from examples or experience.

Machine Learning (ML)

Just as humans can learn from examples and experience, so too can man-made machines.

Machines use a method called machine learning to learn, which allows artificial intelligence systems to be more than just a set of pre-programmed actions, but to come up with new solutions on their own.

Lesson Overview



Recommended Age, Lesson Length

Children aged 8-11, 45–90 minutes.

Building Blocks

Artificial intelligence, intelligent behavior.

What Are the Students Learning?

Some devices use artificial intelligence technologies in everyday life, others do not.

Why Are They Learning This?

Based on an understanding of the specifics of intelligent machines, they can find creative solutions to problems (long-term goal).

How Do We Know They Have Learned It?

They will describe the differences between devices that use artificial intelligence and those that do not use AI. They will give specific examples of them.

Tools

Teacher: Printed worksheets and presentations to show.

Students: Writing supplies.

Digital Competence

Facilitating Learners' Digital Competence.

Bloom's Taxonomy

Understanding: Students describe the differences between devices with AI and without AI, explain how AI works, and identify examples of its use.

Applying: Students apply the knowledge gained in filling out tables and deciding which devices use AI based on defined characteristics.

Analyzing: Students analyze the properties of the device (e.g., ability to respond to the environment, use of sensors) and evaluate whether they meet the criteria for AI.

Five Big Ideas

1-B-I Processing (Sensing vs. Perception).

5-B-I AI & Culture (AI in Daily Life).

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

Engage

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Presentation slide 01

Read and discuss with students.

Hi! Here we are again, Hoo and Ray – or HooRay, as they call us now. Remember? Two robots who are advised by an installed program to learn new things and, most importantly, to help. The last time we tried to help, things didn't go so well. We wanted to do a lot of good, but somehow it didn't turn out the way we thought it would. But we're not giving up! We are modern technology, after all!

So we thought: "Why don't we go talk to the people who have been doing it for a long time?" And where else would robots go to gain experience than a technical museum? After all, among all these inventions and machines – or rather, among the uncles and aunts – there must be someone who can advise us on how to properly help you humans. After all, that's why you made them, right? At least it will show who the smart technology is here!

**Why do you think people invent technology?**

Possible answer: People invent technologies to make their work easier.

But what do you mean by technology? Feel free to give a specific example.

Students will probably answer: phone, tablet and other devices. Introduce them to the fact that technology, in general, uses some knowledge for a practical purpose. These are things, devices or systems that people have developed to make their activities easier or better. Good examples could be, for example, printing, flint...

Sometimes we also talk about modern technologies. How are they different? Give specific examples.

Possible answers: They were developed recently by humans. They can solve more complex tasks or problems. Examples include a smartphone, the internet, artificial intelligence, a computer, a television, a robot, and others.

What would the world look like without modern (digital) technologies? How would our everyday lives change?

Possible answer: We wouldn't be able to chat with our friends or call our parents anymore. We would have to write letters instead, for example.

Imagine an activity that people do manually today. Could robots do it?

Possible answers: Many of us would appreciate it if robots could take over, for example, cleaning, cooking, or helping us with learning.

Understand

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08

Presentation slide 02

First, read the story to the students.

Hoo and Ray went to visit relatives who are already part of an exhibition at the technical museum. They packed suitable gifts, including magnets from their travels, and a lot of questions they wanted to find answers to. But what puzzled them the most was how their ancestors always knew when and how to help people.

Hoo was the first to go with the magnets to his grandpa the knitting machine. He got beautiful sweaters from him - one with a smiley face -:) for Hoo and one with a π sign for Ray on the chest - but he didn't learn much. Grandpa is warm, but he keeps repeating the same things and gets everything new wrong... literally. When he asked him such a complicated question "How do you know what people want?", his threads got completely tangled and instead of another sweater for robots, he knitted something with six holes, so it was just for a cat... and with extra holes for ears.

Ray tried to consult auntie the calculator again. She's his favourite auntie because she can draw all sorts of pictures on her display. Like a cat. No really! Look! But she didn't help him much with advice on how to better help people. As she says: "I've never been interested in what people need. They've always just given me a task and I've calculated it. People know best what they need."

Hoo and Ray gave it another try at auntie's, who's a bit of a weirdo. She's an old Atari game console. She has a very small memory, but sometimes interesting ideas come out of her! This time Hoo and Ray were lucky. Aunt Atari told them that they could have their own intelligence. It's called artificial intelligence. "Imagine it - you'll be able to generate countless ways to help people, and you'll have more knowledge than all your grandmothers and aunts combined." Now all they have to do is find something in the technical museum that already uses artificial intelligence... after all, according to aunt Atari, scientists have been working on it for 70 years! So there must be something like that here.

Hoo and Ray began to explore the museum building. But how do you recognize artificial intelligence? It would be best to look at each word separately. The word artificial is used to refer to something that is not natural and is usually created by humans.



What do you imagine when you hear the word artificial?

Possible answers: Plastic things, prosthesis (artificial limb)... If none of the children mention it, also bring them to the words technology, machines and robots.



And now the second word – intelligence. Adults often have different opinions about it. Some people study the intelligence of people, animals, plants and even create artificial intelligence. Artificial intelligence is a program that imitates how people think or act. Some robots have it and thanks to it they can help solve tasks that previously only humans were able to do. Thanks to intelligence, we can understand different things, learn and acquire new knowledge or skills, plan, make decisions, cooperate...



Can you think of any activities that machines do that people consider intelligent?

Possible answers: Cars that drive themselves. Programs that help doctors find diseases on X-rays or that recommend content to us when searching or on YouTube, for example...



Presentation slide 03

And how does it work in reality? You can watch a few videos (links can also be found in the presentation slide 03):

Samsung Smart Vacuum Cleaner: youtube.com/watch?v=ELo54GVDuOw (1:59).

Robot parkourists: youtube.com/watch?v=tF4DML7FIWk (1:05).

Self-driving car: youtube.com/watch?v=PWOpmXbKf4A (12:06).

Activity

Presentation slides 04 and 05

Distribute worksheets to students for individual work (or in pairs).

Now you have enough clues to help robots recognize things that use artificial intelligence. Look at the table in the worksheet. There are various statements in the top row. Then there are several devices in the left column. If you think the statement is true for the device, draw a smiley face. If not, make a cross. From the table, you now know that a calculator does not perceive its surroundings using sensors, but a self-driving car does. If you are not sure, nothing happens. Go ahead and we will come back to this later. If you fill in at least 3 smiley faces for a given device, it is likely to use artificial intelligence.

Students may give different answers depending on how they imagine the device. Explain that many of them use sensors, such as cameras, microphones, or light sensors. But those that use artificial intelligence are unique in that they can learn from the data they receive from the sensors.

Example: A camera without artificial intelligence can take photos of animals in a zoo, while a camera with artificial intelligence may be able to accurately recognize and name which animals in a zoo are in the picture, or even sharpen and edit the photo on its own.

You can spark a debate on what would happen if all machines had AI. For example, an electric kettle would start boiling water by itself because it "sees" that you want coffee, etc.



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20

The table could be filled in, for example, like this. Below we describe the types of devices according to which we filled in the table. But it really depends on what kind of device someone imagines. Therefore, no answer may be wrong. The table therefore serves as a basis for discussion.

	<u>Does it sense its surroundings with sensors?</u>	<u>Does it respond to its environment?</u>	<u>Does it learn to do things differently?</u>	<u>Does it make decisions and plan?</u>	<u>Does it use artificial intelligence?</u>
Calculator	✗	✗	✗	✗	NO
Self-driving car	🤖	🤖	🤖	🤖	YES
Gramophone	✗	✗	✗	✗	NO
Voice assistant	🤖	🤖	🤖	✗	YES
Microwave	🤖	🤖	✗	✗	NO
Navigation	🤖	🤖	🤖	🤖	YES
Camera	🤖	✗	✗	✗	NO
Robotic vacuum cleaner	🤖	🤖	🤖	🤖	YES
Smart phone	🤖	🤖	🤖	🤖	YES

Devices that use artificial intelligence:

Self-driving car

It uses many AI systems – for example, for recognizing traffic signs. In order for this system to be able to recognize signs, it first had to be shown many examples of what the signs look like and what they mean. The same goes for identifying pedestrians, cars, and many other objects.

Voice assistants (e.g. Alexa, Siri)

Assistants use artificial intelligence to convert voice to text and vice versa. They respond to voice commands and they also learn from them to respond better.

Navigation

Thanks to AI, navigation takes into account the current traffic situation and offers the best routes based on it.

Camera

If there is AI in the camera, it can, for example, recognize objects in a scene (e.g., a human face) and then focus on them or apply filters. It's the same as with systems in self-driving cars – in order for the program in the camera to be able to recognize objects, it first had to learn from many examples (e.g., images of faces).

Robotic vacuum cleaner

Some robot vacuums don't use AI, moving around the home in pre-programmed patterns (e.g., turning 90 degrees if it encounters an obstacle). But those that do use AI continually learn to navigate the home as efficiently as possible, not only based on the floor plan, but also, for example, where they vacuum most often.

Smartphone

Smartphones use AI to unlock the phone using your face or fingerprint, for example. They also track our usage habits and preferences and adjust the phone's operation accordingly, which can lead to, for example, to save battery. AI also allows for transcription of spoken words into text (we can dictate messages) and vice versa. Or they automatically correct what we write in a message, and much more.

Devices that do not use AI:

calculator – only does the things it was programmed to do, gramophone – mechanically reproduces sound from a vinyl record, microwave – only performs the activities it was programmed to do, camera – older type (for example, SLR) without scene recognition, etc.

Reflect

min
40



Read the story and discuss it with your students.

Hi! It's us again, Hoo and Ray, after another adventure at the technical museum. Our journey to learn how to better serve people has taken us back to our ancestors.

Grandpa the knitting machine will certainly please everyone with his sweaters, but his patterns could be a little more modern. He's not moving anywhere much... And auntie the calculator is great at calculating examples, but the two of us are not here just to complete tasks; we want to understand people, adapt and help them.

"That's true," said Ray. "Auntie Atari was the best! When she said we could have our own artificial intelligence, that was something, right? Suddenly, it wasn't about everything we already knew how to do, but about everything we could still learn and know."

"Exactly," agreed Hoo. "And that led us to look for AI in the museum. Imagine, Ray, all the devices we've explored... An AI-powered smartphone that understands what we want it to do. Or a self-driving car that learns from every drive. And voice assistants, like Alexa or Siri, that answer our questions and help us with everyday tasks."

"But you know what I was most interested in?" Ray jumped. "How artificial intelligence can change our view of what is possible. It's not just about what AI does, but all the possibilities that lie ahead."

Ray looked down at his robotic hands and said, "This is our journey, Hoo. It's not about finding the latest technology. What's more important is how we use it to better understand the world around us, and how we can be useful."

And that's the story we want to write. Together."



What can newer computers and robots do compared to old ones?

Possible answer: New computers and robots can learn new things, like we learn to ride a bike. They can also try new things and help us better than old machines that did the same thing over and over again.

So how do machines (robots, computers...) differ when they use artificial intelligence?

Possible answer: Machines that use artificial intelligence can not only do various things independently, but can also learn from many examples or situations and adjust their behavior based on them.

How could learning computers help us at school or at home?

Possible answer: Computers that learn could help us with our homework by explaining things we don't understand, or they could teach us new games and skills.

Remember grandpa the knitting machine from our story? Do you think it's better if machines always do the same thing, or if they can learn and change according to what we need?

Possible answer: It may or may not be better. It depends on what the machine is intended for. But for grandpa the knitting machine, it would be nice if he could generate new patterns.

If there's extra time

min
45



Presentation slide 06




Cook up an emoji in Google's [Emoji Kitchen](#).


It's easy! Just click the "Let's cook" button and enter a combination of two emojis.

Why Emoji Kitchen?

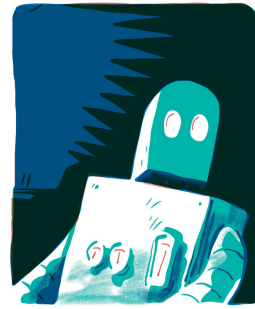
The history of Emojis is extremely interesting. Currently, there are less than 4,000 of them in the [UNICODE standard](#). Designers at Google, who are developing the Emoji Kitchen application, are looking for a solution to generate emoticon combinations using artificial intelligence in the future. There are over 7 million possible combinations of two emojis.



Dear children, please help us find out where artificial intelligence is and where it is not.

In the table, draw a smiley face  each time you think the statement in the top row is true.

On the contrary, if you think it is not, then make a  cross.

If you don't know, nothing happens, come back to it later.



	Does it sense its surroundings with sensors?	Does it respond to its environment?	Does it learn to do things differently?	Does it make decisions and plan?	Does it use artificial intelligence?
Calculator					
Self-driving car					
Gramophone					
Voice assistant (e.g. Siri, Alexa...)					
Microwave					
Navigation					
Camera					
Robotic vacuum cleaner					
Smart phone					

If you put at least 3 smileys for each device, it most likely uses artificial intelligence!