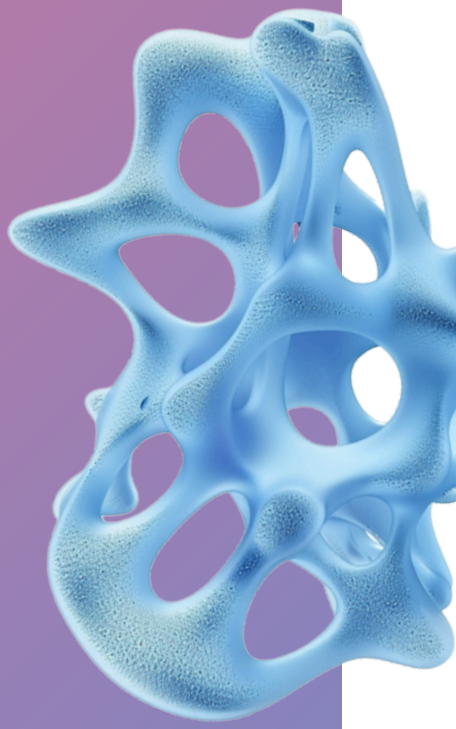
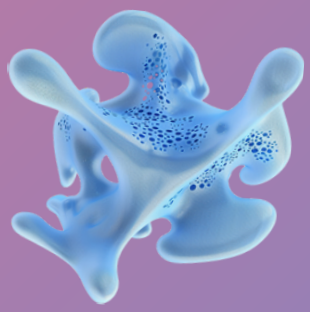
AI for Children

Artificial Intelligence Curriculum for Elementary and Secondary Schools

Chemistry I

Guess the Chemical Elements!





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

Form for comments

National Pedagogical Institute of the Czech Republic

We create methodologies in cooperation with the National Pedagogical Institute.

AI for Children's Artificial Intelligence Curriculum Teaching material
for the Development of Digital Competence for Elementary and Secondary Schools

Chemistry I – Guess the Chemical Elements!

A few words to begin

Dear Teacher,

You are receiving a teacher material developed to support the teaching of artificial intelligence at the elementary and secondary school levels. To carry out the lesson, it would be a good idea to have a very general understanding of the use of chatbots. In this lesson, students use chatbots to repeat and acquire new knowledge about the properties of elements from the periodic table. At the same time, the chatbots are ready to offer information about each element, which the students verify from reliable sources. The lesson develops reading comprehension and critical thinking skills in students. It emphasizes verifying the information that the chatbot generates. Thank you for your desire, energy, and courage to introduce children to the topic of artificial intelligence.

– AI for Children team

Lesson presentation in PDF

Editable presentation in Canva

Lesson Overview

Recommended Age, Lesson Length
Children aged 13–15, 45 minutes.

What Are the Students Learning?
Chemical elements have specific properties and uses.
Chatbots can be helpful for work and learning, but they sometimes generate incorrect information.

Why Are They Learning This?
They adopt methods and strategies for effective and meaningful learning, and critically assess and evaluate machine-generated outputs.

How Do We Know They Have Learned It?
They analyze how chatbots work, compare their outputs, and critically evaluate the accuracy of the information they provide.

Five Big Ideas
AI & Culture (AI in Daily Life).

Tools
Teacher: projection equipment, presentation for display.
Students: worksheet, writing utensils, chemistry textbook, periodic table of elements.

Digital Competence
Professional Engagement.
Communication and Collaboration.

Bloom's Taxonomy
Remembering: Students practice and reinforce their knowledge of chemical elements and key terms related to chemical properties.
Analyzing: They analyze the quality of a chatbot's output and distinguish between accurate and inaccurate information.
Evaluating: They assess the relevance and accuracy of the information provided by the chatbot and discuss its meaningfulness.

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

Glossary of terms

Artificial Intelligence (AI)
There is no single, universally accepted definition of artificial intelligence. However, all definitions agree that AI refers to systems designed to simulate human thinking and actions.
Artificial intelligence typically takes the form of a computer program and is used to solve problems that once required significant human intelligence – tasks that were considered uniquely human.
Besides being a technology, AI is also a scientific field that emerged in the first half of the 20th century.
It focuses not only on understanding intelligent systems but, more importantly, on building them.

Machine Learning (ML)
Just as humans can learn from examples and experience, machines created by humans can do the same.
The method they use is called machine learning, which allows AI systems to go beyond following pre-programmed instructions and instead come up with new solutions on their own.
The main goal of machine learning is to identify patterns in large amounts of data. Machine learning is a subfield of artificial intelligence.

Chatbot
A chatbot is a computer program designed to automatically hold a conversation with a user.
It uses artificial intelligence or predefined rules to answer questions, provide information, or perform various tasks – such as booking a hotel or ordering food. Chatbots can be found in apps, on websites, or in messaging platforms.

Generative Artificial Intelligence (GAI)
Generative AI is a type of artificial intelligence designed to create new content – such as text, images, music, or videos – based on the data it was trained on.
Unlike traditional AI systems that focus on analyzing or classifying information, generative AI uses algorithms (like neural networks) to "learn" the structure and style of existing data in order to generate new, original content.
This content is often so convincing that it can be difficult to distinguish from that created by humans.

Large Language Model (LLM)
A large language model, such as GPT-4o, is a sophisticated computer program designed to analyze and generate text. It can be used for tasks like machine translation, speech recognition, answering questions, or even composing literary works.
These models are trained on massive datasets – known as corpora – which often include data from sources like the internet (e.g., Common Crawl), digitized books, or Wikipedia.
There are only a few such models in the world due to their immense hardware requirements, and they are developed exclusively by major tech companies.
Currently, the most well-known LLMs include GPT (by OpenAI), Claude (by Anthropic), Gemini (by Google), Llama (by Meta), and LaMDA (by DeepMind).

Preparation for teachers

In this lesson, you can use the chatbots listed below. ↠
Both applications can be used for free to a limited extent.
Students may run out of tokens during the conversation, so we recommend using the paid version. We provide the age limits for both chatbots.

If you choose to use an application with a higher age limit, you can operate it yourself while students simply ask their questions.

ChatGPT
Age 13+

MS Copilot
Age 18+

In this lesson, students use chatbots to review and acquire new knowledge about the properties of elements from the periodic table. The chatbots are also ready to provide interesting facts about each element.

Chatbots can serve students well for this type of activity – whether in class or at home. However, it's important to consistently encourage students to verify the information generated by the chatbot and to reflect on it critically. Chatbot responses vary and their quality can differ. The prompt we've prepared works best in ChatGPT and MS Copilot. We recommend testing the prompt before the lesson.

Copy prompt

Here you will find the prompt to copy.

Link: bit.ly/guess_the_element

AI assistant Guess the Chemical Elements!

Download the AI assistant into the ChatGPT app.

Link: https://chatgpt.com/g/g-681e5a73b4c481918073f78e5e4da5e2-guess-the-chemical-element

The prompt may look complicated, right? That's because we wanted to make sure it works exactly as intended. But don't worry about its complexity – all you need to do is share it with your students. Another way students can play the Guess the Chemical Elements game is by using an AI assistant in ChatGPT.

How AI assistants differ from regular prompts

Unlike standard prompts, which you type into a general chat, AI assistants are created for specific topics or purposes. They can be "configured" to act as experts in certain areas – such as cooking, travel, or language learning. Thanks to this, AI assistants have deeper context and can tailor their responses more effectively to your needs. We've created an assistant specifically designed to play the Guess the Chemical Elements game with your students.

Note: If you want to carry out mass registration of students into ChatGPT during a lesson, it probably won't work, as they would all be registering from the same IP address. Therefore, it is necessary for them to register using their school account from home.

Engage

10 min

10 min
Think & write

Discuss with students.

Have you ever thought about the fact that everything around us – from the water we drink to the phones we use – is made up of different chemical elements? Each of these elements has unique properties. Which element comes to your mind first? And what are its properties?
Students write down chemical elements and their properties on small slips of paper. Then they can throw all the slips into a basket and draw a few examples. Students can add more properties or additional information about the drawn elements, if anything comes to mind.

Show the students the periodic table of elements.
Each element in the periodic table has its place – you can think of the periodic table as a kind of map. What does it tell us about the elements?
The periodic table is an arrangement of all known chemical elements, ordered by their atomic number (the number of protons in the nucleus). It helps us understand the structure of atoms and the behaviour of elements, and it serves as a tool for predicting chemical reactions.

Today, we'll learn about elements using chatbots. Have you ever worked with chatbots before?

Understand

25 min

5 min
Introduction

20 min
Activity 01

Presentation slide 02

How to work with chatbots.
Show students the presentation on slide 02. Explain that these are simple but very important rules for using chatbots. For chatbots to work well, it's crucial to describe clearly and specifically what students expect from them. Just as important is to read the generated text, reflect on it, and critically evaluate its content. If students are unsure whether the information is factually correct, they should verify it using other sources.

Presentation slide 03–06

Students then play the Guess the Chemical Elements game in groups. Share with students the link to the AI assistant or the prompt to be entered into the chatbot, as shown in the presentation.

If you chose to use ChatGPT, share the link to the AI assistant shown on slide 03 of the presentation. Students must be signed in to ChatGPT in the browser where they want to use the AI assistant.

If you're using a different chatbot (tested earlier with our suggested prompt), share with students the Google Doc with the prompt. The link is available on slide 04 of the presentation.

Distribute the worksheet or show the slide on slide 05.
Students start the conversation in the chatbot window by typing "Hello" (if using the AI assistant). If not, they paste the prompt. The application will then begin to provide information and ask questions.

When students correctly name an element in the game, the chatbot will provide:
1) Two properties of an element.
2) Two possible uses of the element.
3) Two facts about the element from the periodic table.

Students verify the chatbot's information (slide 06 in the presentation).
They write the information into the table in the worksheet and verify it using other sources. In the table, they should mark whether the information from the app is factually correct, and if not, write the correction. You can recommend a reliable source, for example:https://pubchem.ncbi.nlm.nih.gov/periodic-table/

Reflect

10 min

Share

Each group will choose one selected element that its members guessed and verified the information about. You can use the following questions:
What new things did you learn about the chemical element?
Did you verify the selected information? How did you approach verification?
Did the chatbot provide accurate information?
Did you come across an element whose properties or uses surprised you? What were they?

Describe, reflect

How did your interaction with the chatbot go?
Did you find using the chatbot for revising chemical elements meaningful?
Can you imagine other situations where you could use a chatbot for learning?
In chemistry, but also in other subjects.

Play the game Guess the Chemical Elements.

When you correctly name an element in the game, the chatbot will tell you:
1) Two properties of an element.
2) Two possible uses of the element.
3) Two pieces of information about the element from the periodic table.

Write these pieces of information down in a table and verify them using other sources.

Element Name:

Properties	Verification/ Correction	Uses	Verification/ Correction	Information from the Periodic Table	Verification/ Correction

Element Name:

Properties	Verification/ Correction	Uses	Verification/ Correction	Information from the Periodic Table	Verification/ Correction

Element Name:

Properties	Verification/ Correction	Uses	Verification/ Correction	Information from the Periodic Table	Verification/ Correction

Element Name:

Properties	Verification/ Correction	Uses	Verification/ Correction	Information from the Periodic Table	Verification/ Correction