AI for Children

Artificial Intelligence Curriculum for Elementary and Secondary Schools

Card

Big Data

01 Data Deck

https://kurikulum.aidetem.cz/cards

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

Form for comments

npi | National Pedagogical Institute of the Czech Republic

We create methodologies in cooperation with the National Pedagogical Institute.

Teaching Material for the AI Curriculum for Elementary and Secondary Schools
Computer Science at Secondary Schools - Cards

Big Data

Basic information about big data

There is no single agreed-upon definition of big data, but it is typically described by a few common characteristics: enormous volume, rapid generation, high variety in size and structure, and often lower quality or precision. Big data can include images, videos, audio, text, or so-called digital traces such as user behavior data. It is a result of the rapid growth and evolution of the internet, along with the significant drop in the cost of data storage and processing. The amount of data is usually so large that traditional methods aren't enough – new approaches are needed, such as machine learning techniques.

And if this topic sparks your curiosity😍

Larger volumes of data began to emerge as early as the 1980s [source], but they weren't yet referred to as big data. A major shift came around 2002, when systems became available that could process large datasets quickly on standard computers. This made the process much cheaper and helped accelerate the growth of big data.

Big data comes from a wide range of sources – including IoT devices, records of user behavior online, transportation systems, financial transactions, medical data, and scientific experiments. Its applications are incredibly broad: from personalizing services and predictive analytics in healthcare or finance, to optimizing logistics, improving public services, and managing smart cities. Besides tech companies, big data is also used by government agencies, hospitals, research institutions, and more.

Machine learning plays a key role in working with big data. Using this method, humans can build models that detect patterns in large datasets and use them to predict future events, personalize products and services – often in real time. Big data is also used to train large language models (LLMs).

Data Deck

Big Data
Interpreting Data Using Chatbots

Lesson presentation in PDF

Editable presentation in Canva

Note 1: Gender equality is a key value for AI for Children, but to keep our teaching materials concise, we use masculine grammatical forms.

Classroom Activity

Patterns in human behavior

30–45 min

Activity description

The goal of this introductory activity from the Data deck is to help students realize that big data contains information about everyday human behavior. Through analysis (e.g. graph-based visualization), it's possible to interpret past behavior – and even predict future behavior.

In this activity, students first explore visualizations of big data from Google search using the app The New Normal and compare how online shopping habits have changed. Then, using the website What Are We Searching For, they look for behavior patterns in different regions. Finally, they search for and interpret changes in internet user behavior before, during, and after the COVID-19 pandemic using Google Trends.

How activity relates to big data

According to an article on seo.ai, users enter around 99,000 search queries into Google every second – which adds up to about 8.5 billion searches per day. These massive amounts of data are then structured and visualized through tools like Google Trends. However, big data doesn't only come from search engines. It's also generated through the use of social media, online shopping and banking transactions, and data collected from smart devices such as sensors and wearable technology.

Lesson Overview

Recommended Age, Lesson Length
Children aged 14–19, 45 minutes.

Building Blocks
Big Data.

What Are the Students Learning?
Big data can be a tool for understanding complex phenomena.

Why Are They Learning This?
To develop critical thinking and the ability to analyze and interpret complex patterns.

How Do We Know They Have Learned It?
They analyze and interpret patterns in online shopping behavior.

Tools
Teacher: projector, presentation for discussion.
Students: digital devices (in pairs or small groups).

Digital Competence
Communication and Collaboration.

Bloom's Taxonomy
Understanding: Students compare and interpret graphical data representations
Analyzing: Students analyze big data visualizations

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

Engage

10 min

Share

Presentation slide 02

Do you remember when the World Health Organization declared COVID-19 a global pandemic?
Answer: In the U.S., it was March 11, 2020.

Think back to the beginning of the pandemic. How did life change for the people around you?
Possible answers: Schools, stores, restaurants, and movie theaters closed. People mostly had to stay home and could only go out for essentials or walks. We had to start wearing masks. Many states closed borders or issued stay-at-home orders, and people couldn't travel as easily between states or to other countries.

Did people's shopping habits change in any way? What do you think people bought more of?
Possible answers: People slept in more because there was no in-person school, and many worked from home. Online shopping became much more common because stores were closed. People often ordered food delivery. They started buying more things like masks, hand sanitizer, and devices like laptops or tablets for remote learning or work.

Do you think people in different countries or continents bought different things?
Possible answer: Probably yes. People needed different items depending on the rules and restrictions in place in each country.

Understand

25 min

Activity 1

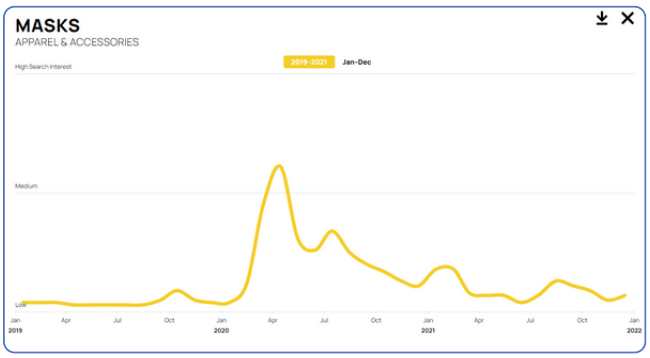
The New Normal

Presentation slide 03

Show students the website The New Normal.
It visualizes how shopping behavior changed based on users' Google search queries before, during, and after the COVID-19 pandemic.

User behavior patterns are sorted into three categories:
New Normal: Search volume changed during the pandemic and that change became the new normal.
Unusual: Search volume changed during the pandemic but later returned to previous levels.
Normal: Search volume remained relatively unaffected by the pandemic.

Go through all three categories with your students. Focus on results (graphs) that are relevant to their lives. We recommend showing, for example, the graph for the search term "Masks."



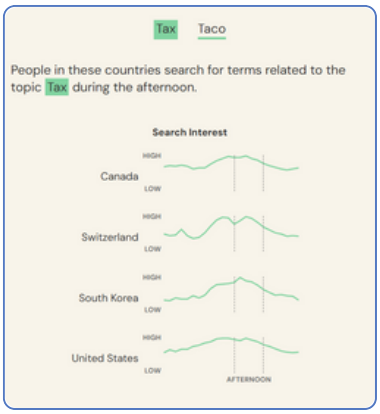
Discuss with your students the reasons behind the increased interest in the search term "Masks" on Google between January 2020 and around June 2022. Also take note of how that interest dropped after two years, in January 2022.

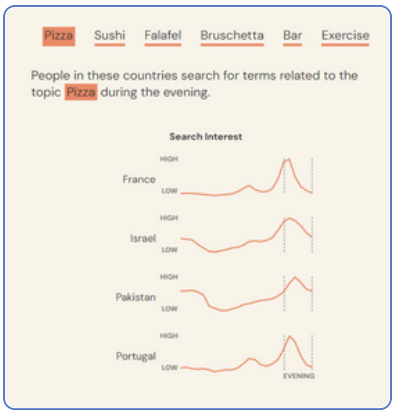
Activity 02

Presentation slide 04

Show students the website What are we searching for.
For example, you can see that people in the U.S. tend to search for tax-related terms mostly during the afternoon– just like people in Canada, Switzerland or South Korea. You'll also notice that interest in pizza spikes in some regions mainly in the late afternoon or evening. See the example images below.

What Are We Searching For





Complete the sentence.

Presentation slide 05

Unfinished sentences
Students complete the following sentences: 1) We already knew that... We found it interesting that...2) We were surprised that... 3) We were wrong to think that... 4) We didn't understand...

Divide students into small groups (each group will need one device). They explore the What Are We Searching For website and write down their sentence completions on paper, using the prompts shown on slide 05 of the presentation. Then, each group shares the most interesting responses during a class discussion.

Activity 03

Presentation slide 06

Analyze pandemic-era data using Google Trends.
Go to trends.google.com/trends/explore
This tool visualizes how often certain terms are searched on Google. You can explore trends by time and location, and compare different search terms.

Search for the terms listed below, one at a time. Make sure to adjust the time range to February 2020 through December 2022 – this focuses on the pandemic period and adds a few extra months to see how things changed afterward. Set the region to United States. Keep in mind that the numbers in Google Trends are relative – they show popularity over time, not exact search counts.

Try searching for terms like: Toilet paper, hand sanitizer, face masks, baking yeast, unemployment, grocery delivery, train tickets.

Google Trends

Have students interpret why these particular search terms were trending the way they did.

Toilet paper

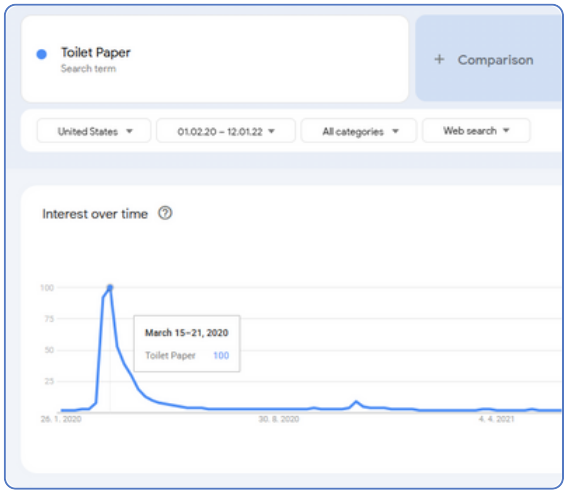
Sewing machine

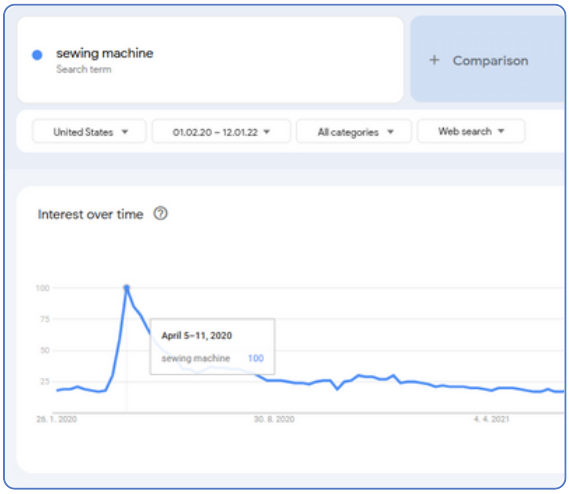
Train ticket

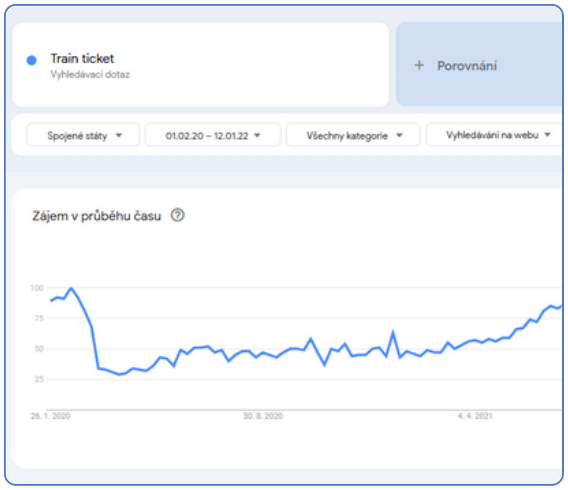
Sticky Note Method

Presentation slide 07

Search results for the terms “rubber bands,” “sewing machine,” and “train ticket” (see slide 07 of the presentation).







Students work in pairs and look for other search terms associated with the COVID-19 pandemic.

Sticky Note Method
Students write search terms on slips of paper (or sticky notes) and then group them based on similarity or shared themes.

During the follow-up discussion, interpret the most common or interesting notes or clusters together.

Reflect

10 min

Think about it.

Presentation slide 08

Can you think of other topics or time periods that would be interesting to analyze using big data?

What comes to mind when you hear the term "big data"?
There is no single official definition of big data, but it typically refers to data that is extremely large in volume, generated at high speed, and highly varied in form (both in size and structure). It often includes data that is less precise or lower in quality. Big data can include images, videos, audio, text, or so-called digital traces such as data about user behavior. It's a result of the rapid growth of the internet and the falling cost of storing and processing data. The volume is usually so large that it requires new approaches to process it – like machine learning.

How many Google searches do you think people make per day?
According to an article on seo.ai, users enter about 99,000 Google searches every second, which adds up to approximately 8.5 billion searches per day.

Where else do you think big data is generated?
Big data is created in many parts of everyday life. It comes from our activity on social media, online shopping, and banking. Government systems collect it through traffic and safety monitoring. In healthcare, it's gathered from medical records and devices. It also comes from sensors and cameras in public spaces or inside buildings.

How could we use big data in the future?
Big data helps with weather forecasting by combining sensor data from around the world. It can also predict and reduce the impact of natural disasters. In agriculture, it helps improve crop yields by analyzing soil, climate, and water use – making farming smarter and more efficient.