



Because maths matters!

Welcome to the MEI conference 2026

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The background is a solid dark teal color. It is decorated with several geometric elements: a 5x6 grid of small light green dots in the top left; a large, dark teal chevron pointing right on the left side; a series of vertical light green lines of varying heights in the top right; a solid light green rectangle on the right side; and a series of horizontal light green lines of varying lengths in the bottom right.

Exploring the environmental impact of AI

Andy Lumley

Cath Moore

Discussion

Where do you use AI? Where might your students use AI?

Watch out for errors / typos!

Why we wanted to run this session

Wanted to answer the question: what is the environmental impact of A1?



Using AI to work out how much AI impacts the environment

And possibly how we can use AI in a better way...

Aims:

- Draw attention to the things around AI that people might not think about
- Consider how students might interact with the information
- Share some ideas for activities to use in the classroom

Why is this important?

The CAR highlights the following:

Understanding AI Impact and Ethics

- Tasks exploring AI's environmental footprint directly address the review's call for students to understand the broader implications of technology.
- **AI Capabilities and Limitations:** "While the long-term impact of AI remains uncertain, young people should **understand how it works, its capabilities and its limitations**" (p. 38).
- **Critical Thinking in a Digital World:** The review advocates for "Critical evaluation of online content," which is "essential for **navigating misinformation and disinformation**" (p. 38).
- **Ethical Dimensions:** It recommends that schools explore the "**social, emotional and ethical dimensions** of digital life" (p. 38).



Environmental and Global Awareness

- Linking data use to the environment supports the recommendation to integrate sustainability across the curriculum.
- **Urgency of Climate Education:** "The **climate crisis is the most significant environmental challenge of modern times...** it is essential that the [curriculum] embeds climate education and sustainability appropriately across the key stages" (p. 83).
- **Preparing for Change:** "Our curriculum must equip young people for a world that is changing quickly... The climate crisis brings wide-ranging, urgent challenges to address - but also **opportunities to seize, as we seek to restore our environment**" (p. 34).

Some data (from AI searches of course!)

◆ AI Overview

The carbon footprint (CO_2e) of digital communication varies significantly based on the platform, data size, and, for emails, whether they have attachments or large chains. Generally, instant messages have a lower carbon footprint than emails, though they all contribute to data center emissions.

Email (CO_2e)

- **Average Email:** ~0.3g to 4g of CO_2e .
- **Simple/Short Email:** ~0.3g to 0.4g of CO_2e .
- **Email with Attachment/Images:** Up to 50g of CO_2e .
- **Total Annual Impact:** An average office worker produces about 135 kg of CO_2e per year just by sending emails.
- **Tips:** Reduce file sizes, avoid "Reply All," and delete old emails to reduce storage.

What is the carbon footprint for sending an emoji in response to an email in Outlook?

⚡ Estimated Carbon Footprint of an Emoji Reaction

Sending an emoji reaction is essentially sending a tiny metadata packet, much smaller than a regular email.

Action	Estimated CO ₂ Emissions
Emoji reaction (e.g., 🍌)	~0.1 – 0.5 g CO ₂ e

For context:

- This is equivalent to **a few seconds of LED light bulb usage**.
- Reactions are much more efficient than replies like "Thanks" or "Got it" (which can be ~4 g CO₂e or more).

What is difference in the carbon footprint of a google search with and without the Gemini summary?

Comparison: Google Search vs Gemini Summary

Action	Estimated CO ₂ Emissions per Query
Standard Google Search	~0.2 – 0.8 g CO ₂ e
AI Summary (Gemini/SGE)	~3 – 10 g CO ₂ e

Teams Messages (CO_2e)

- While specific, widely accepted, independent figures for a single Teams message are less common, they are considered significantly more sustainable than emails, particularly when replacing long email threads.
- Teams chat is designed for rapid, short interactions, often consuming less energy than sending a formal email.
- **Video Calls:** A one-hour, six-participant HD meeting produces ~0.05kg (50g) of CO_2e . Turning off cameras can reduce this by 96%.

WhatsApp Messages (CO_2e)

- **Single Message:** Approximately 0.05g to 0.2g of CO_2e , making it one of the most carbon-efficient communication methods.
- **Media:** Sending videos, GIFs, or photos increases this, while simple text or emojis have a much lower footprint.
- **WhatsApp Group:** An active group chat can consume about 2.35kg of CO_2e per week.

Comparison Summary

Communication Type	Estimated CO_2e per Instance	Key Factors
WhatsApp Message	~0.05g - 0.2g	Highly efficient
Short Email	~0.3g - 4g	Standard, no attachment
Email w/ Attachment	~50g	High impact
Teams Message	Low (similar to SMS)	Sustainable for quick chat

Key Takeaway: To minimize your carbon footprint, prefer short instant messages (Teams/WhatsApp) over emails, keep email threads brief, and remove attachments whenever possible.

◆ AI Overview

A single, standard query to ChatGPT is estimated to produce **between 2 and 5 grams of CO_2e** (carbon dioxide equivalent). While this amount is small on an individual basis, it is significantly higher than a standard Google search (approx. 0.2–0.5g CO_2e). 

Here is a breakdown of the environmental impact of a ChatGPT interaction:

Key Metrics

- **Per Query:** A commonly cited figure for a ChatGPT query is **4.32 grams of CO_2** .
- **Comparison:** One query can produce 10 to 20 times more carbon than a single Google search.
- **Context:** 15-20 queries are roughly equivalent to the carbon emissions of watching one hour of video streaming.
- **Water Usage:** Beyond carbon, a 20-50 question conversation with ChatGPT can consume roughly 500ml of water for cooling the data centers. 

✦ AI Overview

While there is no publicly available, exact CO_2e (carbon dioxide equivalent) figure for a single "Thank you Alexa" command, it is part of the broader energy usage of voice-activated AI, which is generally very low per interaction.

Here is the breakdown of the environmental impact based on the available information:

- **Extremely Low Energy Usage:** An Echo device consumes about 2 to 4 Watts while active. A "thank you" interaction lasts only a few seconds, involving a voice command processing (voice-to-text) and a quick cloud response, which is a very small fraction of a Watt-hour.
- **Data Center Impact:** The main energy cost comes from the cloud data processing required to understand and respond to your voice.
- **Comparison:** A simple voice command, like "Thank you," uses significantly less energy than, for example, streaming a high-definition video. It is likely in the realm of a fraction of a gram of CO_2e , similar to sending a very short text-based email or a simple search query. 

What is the carbon footprint of data storage in the cloud compared with storage on data silos?

Example: Storing 1 TB of data for 1 year

- **Cloud (efficient provider, renewable-powered):**
→ ~1 kg CO₂e/year
- **On-prem data silo (older hardware, fossil-fueled grid):**
→ ~10–20 kg CO₂e/year

Why Cloud Is Usually Greener

1. **Data center efficiency** (hyperscalers invest in cooling, hardware optimization).
2. **Better server utilization** (you only use what you need).
3. **Renewable energy** (many providers aim for 100% clean energy or buy offsets).
4. **Server lifecycle management** (upgrades and decommissioning are optimized at scale).

Two tasks

We are going to share 2 tasks with you

You can either work completely through one, or experience starting both

Put yourself in the role of a student

How might you want to adjust the tasks for different groups of students?

The data diet task

Think about your data diet for a week.

How is it different if you are a Year 7, Year 11, Year 13, 35-year-old?

Be ready to justify your conclusions.

Your data diet

Estimating how much data your daily activities use is an art not a science, but here are best estimates of how much you are gobbling up online.

- **Listening to a podcast:** 20-100MB an hour
- **Watching Netflix:** 3GB an hour at HD quality
- **Online shopping:** Consider the data size of any images you browse, which can be big, before even thinking of the environmental impact of your delivery
- **WhatsApp text message:** 1-5KB a message, on average
- **WhatsApp voice call:** 400KB-1MB a minute
- **WhatsApp video call:** 2.5-15MB a minute
- **Average pre-AI Google search:** 500KB for a text-based search
- **Average post-AI Google search:** No one knows ...
- **Sending an email:** Depends on the size of the message, but about 75KB on average
- **Sending an email with photo attachment:** As above, plus the size of the attachment
- **Downloading an album on Spotify:** Depends on your audio quality, but around 72MB for an hour-long album
- **Playing a game of Fortnite:** Between 45 and 100MB an hour

How much CO₂e?

Use the CO₂e data to explore ways of reducing the impact of how you communicate.

Be ready to present your findings either as a slide show or a poster.

Tasks to take away

These tasks are ideas for you to use in the classroom with your students. We think a rich task such as these with no 'correct' answer can encourage students to think mathematically without the imprisonment of fractions, trigonometry and inequalities.

How could you adapt these two tasks to use with Year 7, Year 10, Year 13 students?

They are designed to be open-ended, thought provoking. They will need you to *guide* your students through as you need to with the right questions.

What else?

What other things might you want to explore with your classes?

Other sources and resources:

Maths and Climate Change [resources](#)

The Big Earth Data Project [resources](#)

Where maths meets... the world of work [resources](#)

Where's the Maths in that? [Resources](#)

UCL Centre for Climate Change and Sustainability Education [webpage](#):

- [Teaching for Sustainable Futures](#): free subject specific PD
- [Schools for Sustainable Futures](#): funded support from UCL, applications by 13th July

National Education Nature Park [website](#)

How much water does AI consume? [More or Less 28/3/26](#)

The Guardian [article](#) about data centres using electricity produced from gas

The Guardian [article](#) about individual data use



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Thank you MEI conference 2026

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Additional points from the Curriculum Assessment Review

Mathematical Problem Solving and Mastery

- The review emphasizes moving away from rote learning toward deeper application and complex reasoning, which supports your "no correct answer" approach.
- **Deepening Problem Solving:** The report recommends re-sequencing the Maths curriculum "so that topics are introduced in such a way that pupils can master them deeply, with opportunities for **more complex problem-solving in each area**" (p. 186).
- **Real-life Contexts:** It highlights that "without secure foundations in number, pupils are restricted in their ability to **reason in everyday contexts**" (p. 94).
- **Cross-curricular Application:** The review states that mathematical concepts "should then be **applied in different contexts**, where appropriate, in other subjects" (p. 186).

Additional points from the Curriculum Assessment Review

Oracy and Mathematical Talk

- Your goal of encouraging conversation is supported by the review's major emphasis on oracy as a foundational skill for all subjects.
- **Cross-disciplinary Oracy:** Oracy is identified as an area that has "coverage and **application across numerous curriculum areas**," including in primary phases where cross-disciplinary content is vital (p. 49).
- **A New Oracy Framework:** The report recommends that the government "introduces an **oracy framework** to support practice and to complement the existing frameworks for Reading and Writing" (p. 180).
- **Building Empathy and Perspective:** Using discussion-based tasks helps "build **empathy and understanding of others**" by exploring a "wide range of viewpoints" (p. 33).

Additional points from the Curriculum Assessment Review



General Thinking Skills

- Your tasks can be justified by the review's focus on preparing "informed and fulfilled individuals."
- **Problem Solving and Testing:** The report argues that curriculum aims should explicitly "embed attributes such as **problem solving, iteration and testing**" (p. 69).
- **Horizontal Coherence:** These tasks help create "**horizontal links... across subjects** to highlight where content in one area relies on content in another" (p. 49).



Environment

 This article is more than **1 year old**

Concerned about your data use? Here is the carbon footprint of an average day of emails, WhatsApps and more



Chris Stokel-Walker

Thu 31 Oct 2024 12.30 GMT

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Gas

More than 100 UK datacentres plan to burn gas to generate electricity

Requests for gas connections by operators amount to more than 15 terawatt hours per year, endangering climate targets



Aisha Down

Mon 18 May 2026 05.00 BST



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