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The Carbon Impact of e-mails

SUBJECT AREAS:

Natural science

ACTIVITY DESCRIPTION:

E-mails, letters, MB, grams, paper, storage, carbon dioxide

OBJECTIVES:

Learn, categorize, analyze, research, and apply.

MATERIALS:

Computers, tablets or phones
Active e-mail,
Excel worksheet

GRADE/LEVEL:

Secondary school (15-18)

DURATION:

Preparation time: 20 min.

Activity time: 25 min.

PLACE:

Classroom, Laboratory

AUTOR:

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INTRODUCTION:

Before technology, people used postal systems, messengers, carrier pigeons, and personal delivery to send letters. These methods required a lot of time and coordination. Thanks to the development of technology, there is a much faster and easier ways to send mail nowadays. That is through electronic emails. Emails are electronic messages sent and received over the internet. They allow users to communicate and exchange information digitally. They have become a widely used and convenient means of communication. What do you think, are paper letters or electronic emails more harmful to the environment? And in what way do emails impact our environment?

BACKGROUND:

Carbon dioxide (CO_2) is a gas that is harmful because it contributes to climate change, leads to rising temperatures, changes weather patterns, and more frequent extreme weather events. Additionally, CO_2 emissions can trigger feedback loops that amplify climate change. Taking action to reduce CO_2 emissions and transition to cleaner energy sources is essential to mitigate these harmful effects. What do you think, do emails contribute to the production of carbon dioxide? If yes, in which way?

Traditional letters have a higher environmental impact compared to emails. Letters require paper, envelopes, and transportation, leading to deforestation, energy-intensive paper manufacturing, and greenhouse gas emissions. Additionally, the disposal of letters contributes to waste generation and potential landfill usage. In contrast, e-mail operates digitally, reducing paper consumption, energy usage, emissions from transportation, and waste generation. By using electronic devices, E-mail minimizes the need for physical resources and promotes resource conservation. The digital nature of e-mail also eliminates the need for paper production, reducing the strain on forests. Overall, e-mail's electronic platform significantly reduces environmental harm, making it a more sustainable choice for communication compared to traditional letters.
An ordinary text email you click on, open, forward, or reply to, emits 4 grams of CO_2.
If that email has an attachment that measures 1 MB, the emissions go up to 19 grams.
On average, emissions are about 17–18kg per ton of paper. Almost half of the junk paper letters ends up Unopened in landfills. 1. 85 million Tons of Paper Waste Created Each Year.
Think about all the paper products you use on a daily basis.

Procedure:
Outline: checking the storage usage of your email
Instruction:

1. Open your email
2. Check your storage usage
3. Write down your usage

Guided Practice: pay attention to the damage that it is doing to the environment. Calculate the damage that each MB of storage is doing to the environment.

Formative Assessment: after you have calculated the damage we will put it in an excel program to check if it's correct and to calculate the pollution altogether.

Collaborative Process: we will separate two groups of students and compare the results.

Independent Practice: The students will do independent research on digital storage and then put it in a spreadsheet to share their research with the others.

FUN FACTS:

- *Energy Consumption: The carbon footprint of emails comes from the energy required to power the servers, networks, and devices involved in transmitting, storing, and receiving emails. This energy consumption contributes to greenhouse gas emissions.*
- *Spam Emails: Approximately 60% of email traffic is estimated to be spam. This excessive volume of unnecessary emails contributes to higher energy consumption and carbon emissions.*
- *Data Centers: Emails are stored and processed in data centers, which consume substantial amounts of electricity. These data centers require energy for cooling systems and to keep servers running, contributing to their carbon footprint.*
- *Email Attachments: The size of email attachments significantly affects carbon emissions. Large attachments increase the energy required for transmission, resulting in higher carbon emissions. Compressing files or using cloud storage services can help reduce the impact.*
- *Remember that while individual emails may have a small carbon impact, the collective effect of billions of emails worldwide can be significant. Practicing email efficiency, reducing unnecessary emails, and exploring alternative communication methods can contribute to a more sustainable digital footprint.*

ASSESSMENT:

Assessing students' understanding of the carbon impact of emails can be done through various methods. Here's an assessment idea that incorporates different types of questions:

1. **Multiple Choice Questions:**
a) Which of the following contributes to the carbon footprint of emails?
   i) Energy consumption of data centers
   ii) Size of email attachments
   iii) Lengthy email signatures
   iv) All of the above

b) True or False: Spam emails have no impact on the carbon emissions associated with emails.

2. **Short Answer Questions:**
a) Explain how the size of email attachments affects the carbon emissions produced.

b) List two ways individuals can reduce the carbon impact of their emails.

3. **Calculation Questions:**
a) If an email with a 2-megabyte attachment generates 40 grams of carbon dioxide emissions, how much carbon dioxide would be emitted if 100 such emails were sent?

4. **Essay Question:**
Write an essay discussing the environmental impact of emails and propose strategies to minimize their carbon footprint. Support your ideas with examples and evidence.

This assessment approach combines factual knowledge, understanding of cause-and-effect relationships, problem-solving skills, and critical thinking. It allows students to demonstrate their understanding of the carbon impact of emails and encourages them to think critically about potential solutions to reduce their environmental impact.

EVALUATION:

1. Multiple Choice Questions:
Assign points for each correct answer and calculate the overall score accordingly.
2. Short Answer Questions:
Evaluate the short answer questions based on the accuracy and completeness of the responses.
3. Calculation Questions:
Assign points based on the accuracy of the calculations and provide feedback on any errors made.
4. Essay Question:
Evaluate the essay question based on the student's ability to articulate their understanding of the environmental impact of emails and propose effective strategies to reduce their carbon footprint. Assess the quality of their arguments, coherence, clarity, and the incorporation of relevant examples and evidence.