New or recycled paper? - the card game

An investigation into the environmental impact of making new paper or recycled paper

Explain to the pupils that on average each school throws away one tonne of paper every term, that is 400 reams of paper. A ream is 500 sheets.

Ask the pupils:

- How is paper made?
  It is made from all wood and other fibrous plant materials. These fibrous plant materials consist largely of fibres made of a substance called cellulose, The cellulose fibres are separated from the wood material, flattened and lined up to produce paper.
- How is recycled paper made?
  The process is the same except that the fibres come from old paper, cardboard, and card. Cotton and silk can be recycled into paper but the resulting paper is high quality and so expensive. The volume of cotton and silk that is recycled this way is therefore small.
- Can paper be recycled over and over again?
  After 5-7 times of paper being recycled, the fibres become too short to stick together. The paper produced will become poor quality, weak and full of holes.

If possible, ask the pupils to sit in a circle and then give out 23 cards.

Ask one pupil to hold up the '1 tonne of new paper' card.

To make one tonne of paper you need:

- To cut down 15 trees (5 pupils with tree cards stand up)
- 6830kWh of electricity (equivalent) for processing and transporting wood and to run the factory (5 people with electricity cards stand up)
- 108,000 litres of water to make the paper pulp (4 people with water cards stand up).

All of this processing produces:

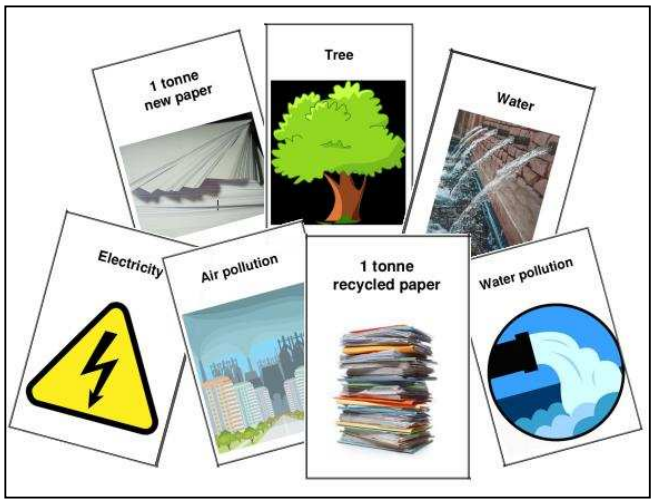
- 38kg of air pollutants (4 people with air pollution cards stand up)
- 16kg of water pollutants (3 people with water pollution cards stand up).

BUT what if the school bought recycled paper?

Ask one pupil to hold up the '1 tonne of recycled paper' card.

For every tonne of paper the school could save:

- 15 trees (5 tree people sit down)
- 60% of the electricity (3 out of 5 sit down)
- 50% of the water (2 out of 4 sit down)
- 75% of the air pollutants (3 out of 4 sit down)



- 35% of the water pollutants (1 out of 3 sit down).

Ask the pupils what the card game shows them.

The environmental impact is less when producing recycled paper than it is when making new paper.

Ask them to give some advantages and disadvantages of producing recycled paper:

Advantages:

- no trees are cut down
- processing uses less electricity and water than making new paper
- there is less air and water pollution than when making new paper
- used paper, cardboard and card can be re-used rather than going into landfill.
- recycled paper is cheaper than new paper.

Disadvantages:

- the paper is never such high quality as new paper.

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The back up:

Title: New or recycled paper? - the card game

Subtitle: An investigation into the environmental impact of making new paper or recycled paper

Topic: This activity gives a visual representation of the environmental impact of making new paper as opposed to making recycled paper.

Age range of pupils: 8 to 12 years

Time needed to complete activity: 15 to 30 minutes depending on the discussion

Pupil learning outcomes. Pupils can:

- explain the paper-making process;
- explain the recycled paper-making process;
- describe what is needed to produce 1 tonne of new paper;

- describe the negative impact on the environment of producing new paper;
- explain what is needed to produce the same quantity of recycled paper;
- discuss the advantages and disadvantages of using recycled rather than new paper.

Context:
This activity could be used in science or geography lessons where the environmental impact of manufacturing and industrial processes is being discussed.

Following up the activity:
Pupils could investigate the paper-making process. If time allows, some could try to make their own paper.

Underlying principles:
- Paper is created using fibrous materials, such as wood. All wood and naturally fibrous materials consist largely of fibres called cellulose which contain very long chains of carbon atoms together with hydrogen and oxygen. These cellulose fibres are separated from the wood material, flattened and aligned to produce paper. In wood, the cellulose fibres are stuck together with a natural glue called lignin which contains cyclic compounds and may be toxic. The more lignin that can be removed, the better the paper.
- To separate the fibres, the wood is smashed and mulched in grinders with water until it is broken down to the individual fibres. The resulting 'pulp' is squeezed and flattened into sheets and allowed to dry, producing giant sheets of paper. These giant sheets and rolls are then cut to a more manageable size.
- The process is the same to produce recycled paper but the fibre is sourced from old paper, cardboard, and card.
- After 5-7 times of paper being recycled, the fibres become too short to stick together. The paper produced becomes poor quality, weak and full of holes.
- Paper recycling is generally beneficial for the environment as it conserves resources, reduces energy consumption, and minimises waste sent to landfills.
- Paper is made from trees which are mostly grown as a cash crop.
- Electricity is needed for processing and transporting wood and to run the factory.
- A reliable, high-volume water supply is needed to make the wood pulp.
- Recycled paper is made from used paper, cardboard and card of varying qualities.
- Air and water pollution occur from both processes but there is less involved in the recycling process.

Thinking skill development:
A pattern emerges as the paper-making process is revealed. Cognitive conflict may arise during discussions (metacognition) when it is realised that neither process has no environmental impact. Relating the card game to the real world is a bridging skill.

Resource list:
- printed copies of the card sheets and scissors
- 5 copies of the tree card
- 5 copies of the electricity card
- 4 copies of the water card
- 4 copies of the air pollution card
- 3 copies of the water pollution card
- one copy of each of the other cards.

Useful links:
https://www.recyclenow.com/how-to-recycle/paper-recycling

Source:
Developed by Elizabeth Devon of the Earthlearningidea Team. Unfortunately, the source of the original idea is unknown.