

Lesson Plan

NEUROHEADWAY

Neuroscience Into Education

'What are the differences between ice, water and clouds?'

- 5 min

The goal of this section is to see what every kid knows about the different states of matter and to allow them to get progressively into the subject by thinking about it by themselves.

Each kid should give their idea about what are the differences between the three mentioned states. At the end of these five minutes, the following explanation should be given to the whole group so that they have a good idea about what the activities are going to be related with: In fact, that was a tricky question. A cloud, ice and 'water' are in fact three different states of a single element: water.

These states are the liquid one, which is the one we all think of when speaking about water, the gas state, of which, for example, clouds are made and finally the solid one, that we call ice in the common language.

Phases of a same element - 15min

These 'states' are called Phases in the scientific language. We have talked about water. Ask the kids if they can think of any other element that exists in these different forms.

The goal of this discussion is to make the kids realize that these three phases apply to every element. Let's first see if they come up with examples. If they do not, try to give them progressively and, at the end, explain them the right 'answer'. For doing that you can use the following examples:

Metal: Who has not seen a film of a blacksmith crafting a sword from liquid to solid metal?

Natural Gas: The one many people use at home for heating or cooking is burnt in a Gas state but transported as a liquid in boats because it takes less space and therefore you can transport more in a single boat !

Chocolate: One has a lot be careful when taking it out of the fridge during the summer, it melts!

Let's think about parameters - 10min

But what external factors have to change in order to see an element go from a phase to another?

Ask the question to the kids and let them think about that in groups of three or four for five minutes. After that, every group should present their ideas to the class. The important conclusion of this section that should be given by you at the end is that Pressure and Temperature are the key parameters.

From molecules to phases - 30min - [Activity]

The goal of this section is to make the kids understand the molecular origin of phase transitions and its link with the parameters mentioned earlier.

Place the tables of the classroom in the shape of a big square (see PowerPoint presentation).

Some of the kids should be inside the square (they should have space to move around), each of them representing a molecule.

Step 1: Low pressure (because the volume, represented by the tables, in which molecules can move is big) and High temperature Kids can move around as they want. Let them do so for a while. In which phase are they? It is a Gas phase.

Step 2: Let's now reduce the space (see PowerPoint), that means High pressure Kids can move around as they want but they have much fewer space now, it is a Liquid phase!

Step 3: Let's now reduce the temperature. Molecules have less energy so kids, instead of running around, have to hold hands with their nearest neighbours and/or touch a table.

Kids can't move at all, they are in a Solid phase.

Step 4: Let's now reduce the pressure by increasing the space in which kids can move again (see PowerPoint).

Does anything change? No, because kids are still holding hands with each other, we are still in the Solid phase.

Step 5: Let's increase the temperature, kids are free to move as they want again.

We are back to the Gas phase.

We just visited the three phases of a system, what path in this picture did we follow?

Power point Example

NEUROHEADWAY
Neuroscience Into Education

What are the differences between
ice, water and clouds?

Let's discuss about it
for five minutes,
give your point of view.

2

Phases of a same element

These different states are called **phases**.

Can you think of **other elements** than water
that behave like this?

3

Phases of a same element

Here are some examples:

Metal



Natural Gas



Chocolate



From molecules to phases

When **parameters change**, **molecules**, which are tiny entities that form the whole element, behave differently. That is what makes **phase transitions** occur

Let's make an activity to understand so.