

ARBETSMATERIAL TILL MODELLEKTIONEN

# "Stöttning under en NO-lektion"

(Org.titel: How can we maximise learning in schooling contexts – for all learners?)

**John Polias**

Director, Lexis Education

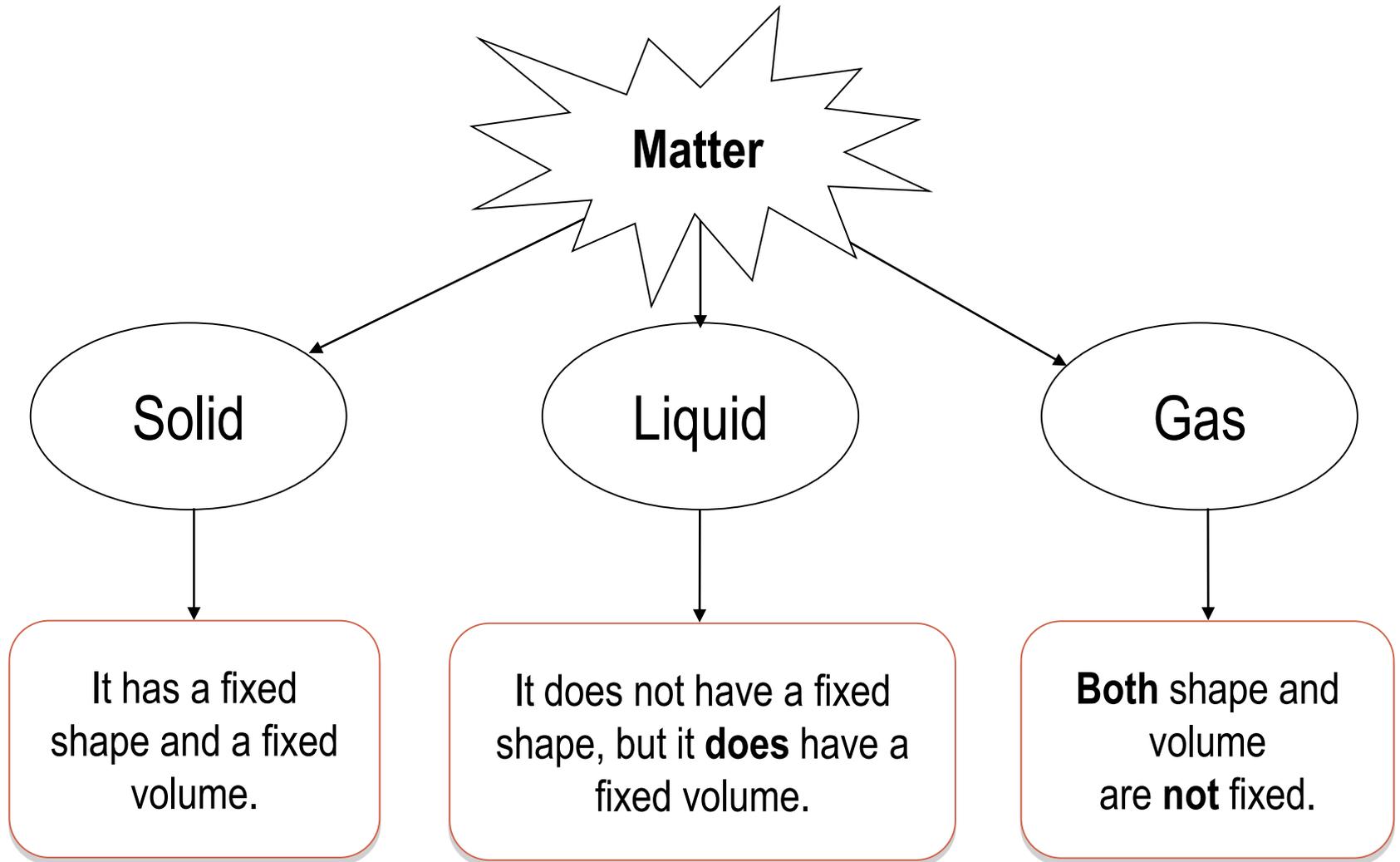
Assistant Professor, The Hong Kong Polytechnic University

Bosatt i Melbourne och Stockholm och arbetar oftast i Hong Kong

Föreläsning inspelad från "Studiedag för lärare på Språkintrö" av UR

Globala gymnasiet, Stockholm, 16 augusti 2016. Arrangör: Stockholms stad

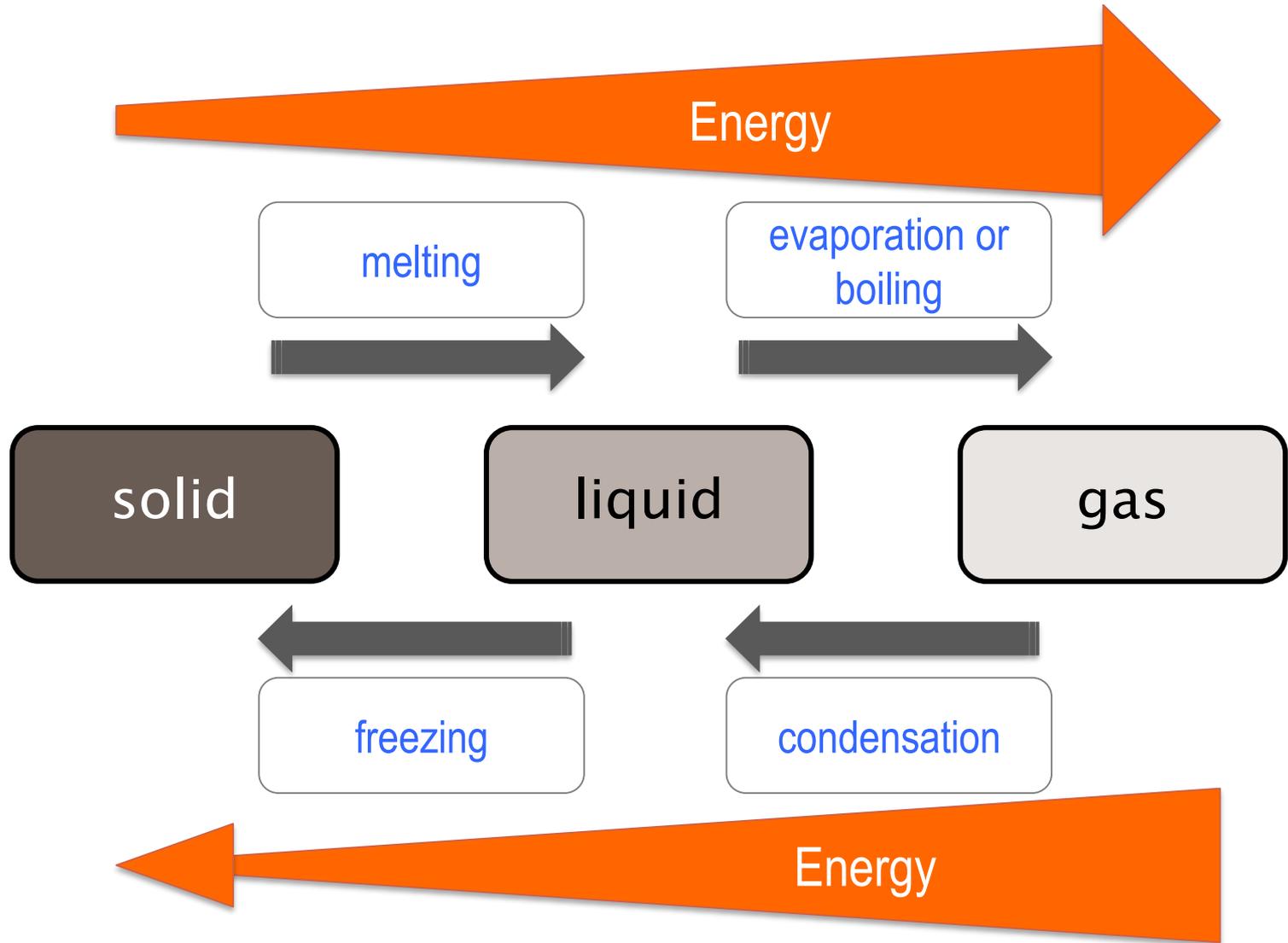
# Three States of Matter



# What does the particle theory say?

Matter is made up of tiny particles and there are spaces between the particles. These tiny particles are constantly moving – they are moving all the time.

# Change of state



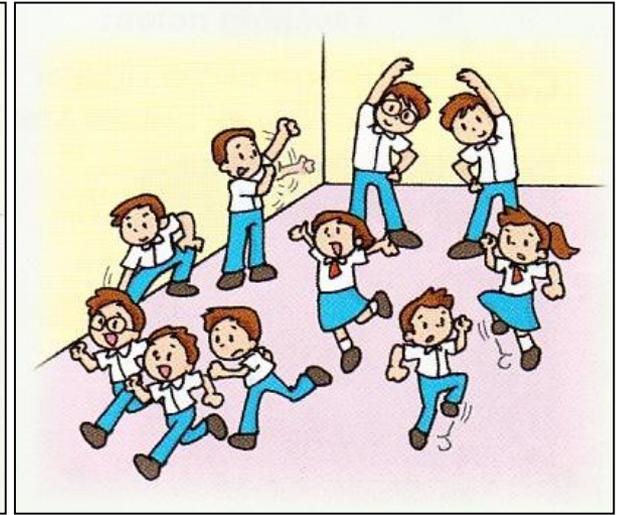
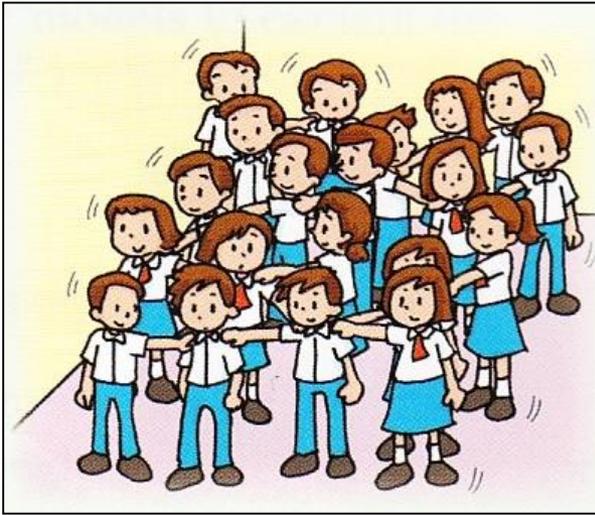
# Simulation with the class

6 students will represent particles in the three different states of matter.

In the solid state, particles are arranged in a regular shape. They cannot move around. They can only vibrate (shake) around their fixed position.

In the liquid state, particles can move around so their positions are not fixed. But, they are still close to each other.

In the gaseous state, particles are able to move freely – they are not restricted. They can be far apart from each other or they can collide with each other.



**State of matter**

**solid**

**liquid**

**gas**

**How can the particles be represented visually?**

**How are the particles arranged?**

**How close are the particles?**

**Can the matter be compressed?**

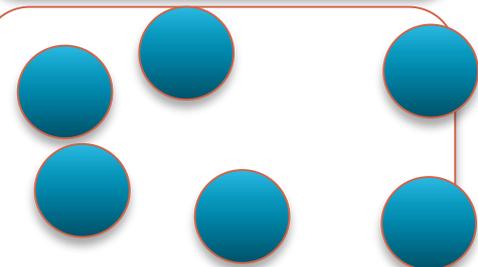
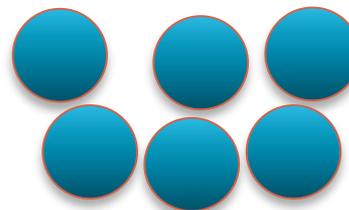
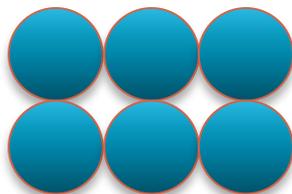
**State of matter**

**solid**

**liquid**

**gas**

**How can the particles be represented visually?**



**How are the particles arranged?**

Arranged regularly

Arranged irregularly

Arranged very irregularly

**How close are the particles?**

Very close

Close but not as close as solid

Sometimes particles are very far apart, sometimes they are close

**Can the matter be compressed?**

# How is energy related to the particle movement?

Because energy is needed to break the bonds between the particles, the kinetic energy of the particles in the liquid state is greater than in the solid state. And the kinetic energy of the particles in the gaseous is greater than the liquid state.

K.E. of gases > K.E. of liquids > K.E. of solids

- In solids, the particles vibrate in fixed positions and they have the least kinetic energy.
- In liquids, the particles vibrate and slide over one another. They have more kinetic energy than the solid state.
- In gases, the particles are free to move and they have the greatest kinetic energy.

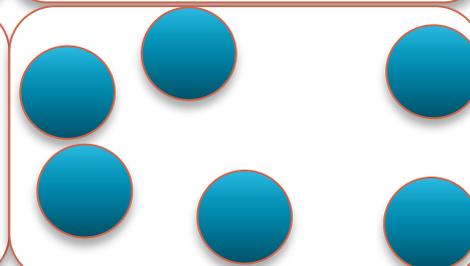
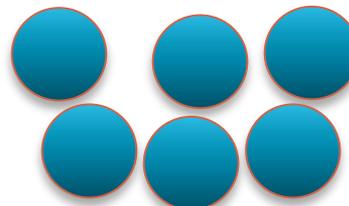
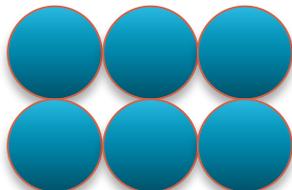
**State of matter**

**solid**

**liquid**

**gas**

**How can the particles be represented visually?**



**How are the particles arranged?**

- Arranged regularly
- Vibrate around a fixed point.

- Arranged irregularly.
- Vibrate faster than in solids and not around a fixed point so they slide over each other.

- Arranged very irregularly
- Move even faster than in liquids and are not in a specific location.

**How close are the particles?**

- Very close
- The bonds between the particles are very strong.

- Close but not as close as in solids.
- The bonds between the particles are less strong.

- Sometimes particles are very far apart, sometimes close.
- The bonds between the particles are weak.

**Can the matter be compressed?**

Difficult to compress

Difficult to compress

Easy to compress

# The particle model of solids, liquids and gases

*Use the particle model to explain the properties of the three states of matter.*

## **Solids**

---

---

---

---

## **Liquids**

---

---

---

---

## **Gases**

---

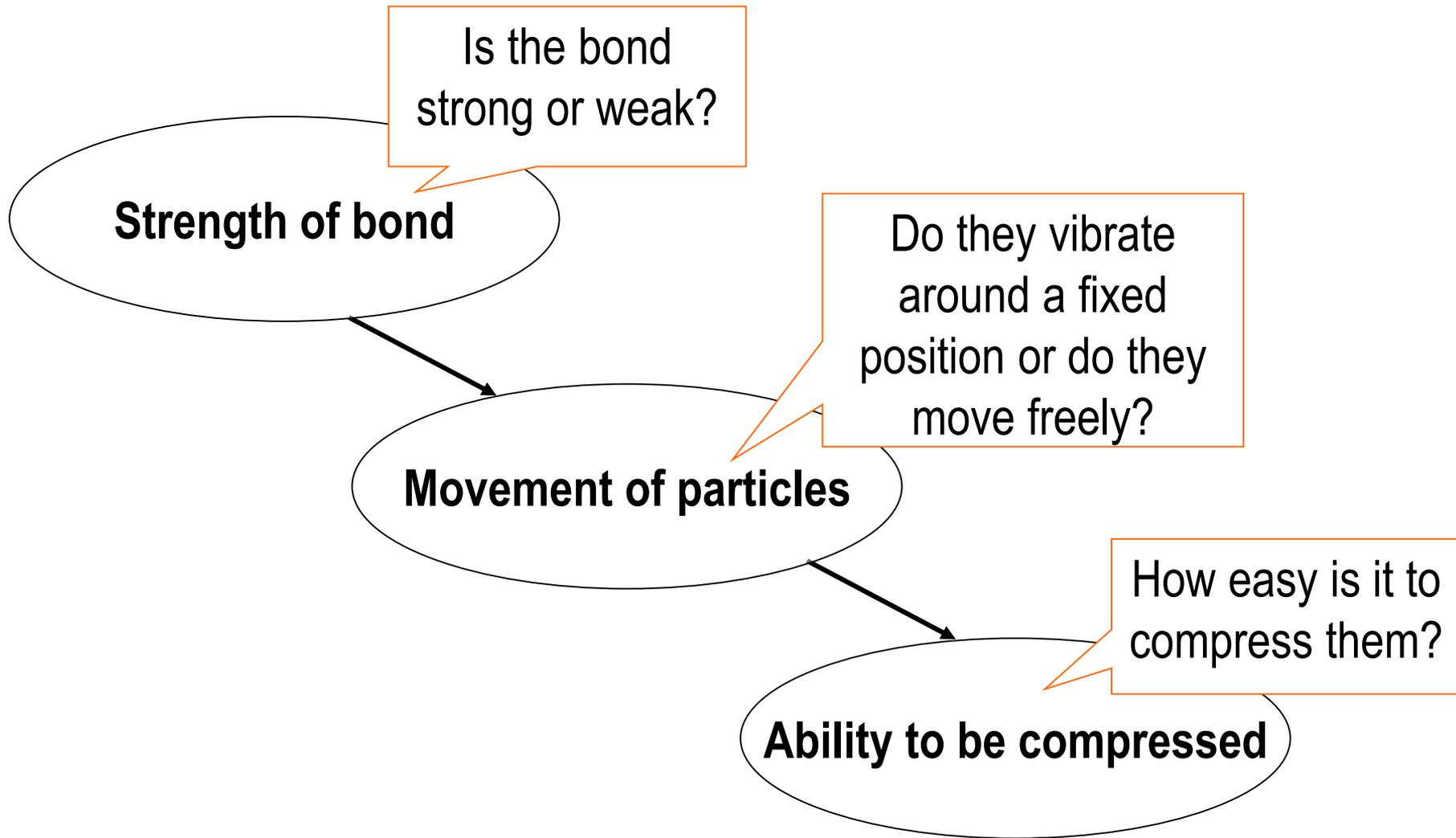
---

---

---

# States of matter

- Step 1: Consider all the properties of each state.
- Step 2: Arrange all the properties in the right sequence.  
(Think of its cause and effect relationship.)
- Step 3: Connect all the material into sentences, which become a paragraph.



# Notes for writing a Description on solids

1. Bonds are strong → particles are close → arranged regularly.
2. Particles move and vibrate around a fixed point.
3. Strong bonds → difficult to compress.

*Use the particle model to explain the properties of the three states of matter.*

## **Solids**

Modelling and Deconstruction

In solids, the bonds between the particles are very strong so the particles are close to each other and they are arranged in a regular pattern. The particles can move but they only vibrate around a fixed position. Also, because of the strong bonds, solids are difficult to compress.

## **Liquids**

Guided Construction

---

---

---

---

## **Gases**

Independent Construction

---

---

---

---