



*la main  
à la pâte*

Scientific concepts and formative assessment

Examine a chain starting with :

- ⚙️ A scientific concept
- ⚙️ The teacher's knowledge about the topic (this concept or a group of associated concepts)
- ⚙️ The transposition of this concept in order to teach students about it
- ⚙️ Throughout the workshop, keep in mind the following question:
  - How can teachers be well prepared to assess (in a formative way) scientific concepts acquired by students during activities (session/sequence/module)?



⚙️ *Objectives: simulate the necessary work for a teacher to integrate the concepts related to a teaching topic*

⚙️ First situation:

- Material: two containers (glasses)
- Question: How could I decant air from one glass to the other?
- Individually write your answer and justify it
- Collective work : a debate regarding the different ideas



*Objectives: simulate the necessary work for a teacher to integrate the concepts related to a teaching topic*

### First situation:

- Verification with experimentation
- Brainstorming in order to list the knowledge possessed by the group regarding air
- Presentation of a document which sum up the properties of air



⚙️ *Objectives: Formulate scientific concepts related to a module, using terms understandable and usable by students.*

a/ Presentation of the synopsis of the module “Is air matter?” and the objectives given by the authors in terms of scientific concepts.

- Knowledge and know-how which pupils should acquire or are in the process of acquiring as a result of the module
  - Ability to differentiate between the states of matter according to some of their properties.
  - An initial awareness of the existence of a new state of matter, the gaseous state. Air is matter in the gaseous state.

## Module / sequence / session

- By module is meant an in depth study of a few selected concepts over an extended period of time.
- A module is made up of sequences generally focused on a single investigation.
- A sequence may be made up of one or more sessions (lessons).



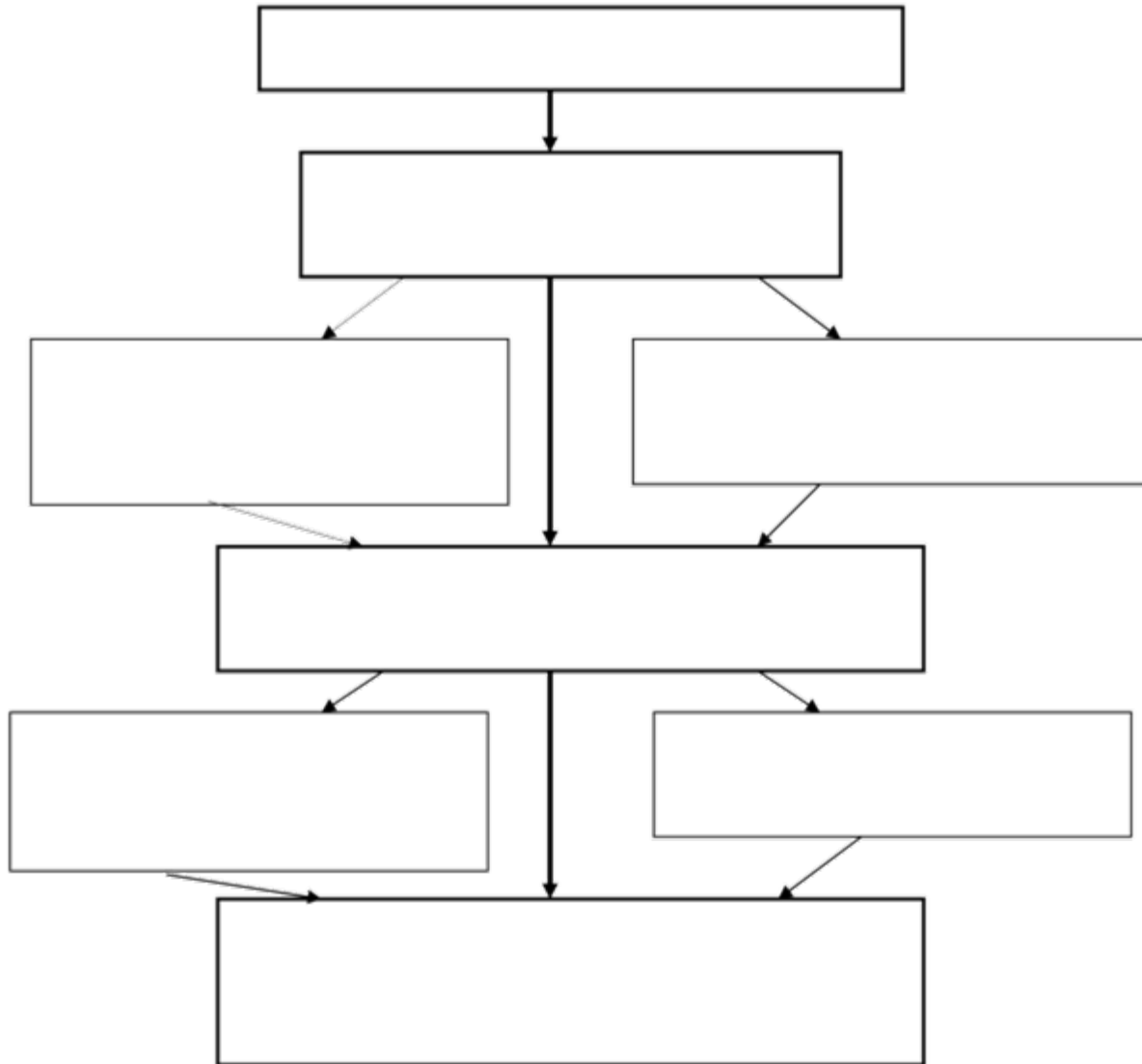
⚙️ *Objectives: Formulate scientific concepts related to a module, using terms understandable and usable by students.*

- a/ Read the synopsis presented in tabular form (chart) (5 min)
- b/ Write the few sentences you would like the pupils (8/9 years old) retain at the end of the module. Work in pairs. Your writing will be read by the other participants. (10 min)
- c/ Read and examine the different propositions. Note them when you disagree and explain why. (10 min)
- d/ Collective debate about the formulations produced by the participants. (15 min)

- ⚙️ *Objective: write the concepts (sub concepts) linked to a general one. Organise the whole concepts in a progression linked to the activities implemented with the students*
- ⚙️ a/ Define a conceptual storyline: (5 min)
  - Give the participants the skeleton of a conceptual storyline about the module "Is air matter?".



# Skeleton of a conceptual storyline : Is air matter?



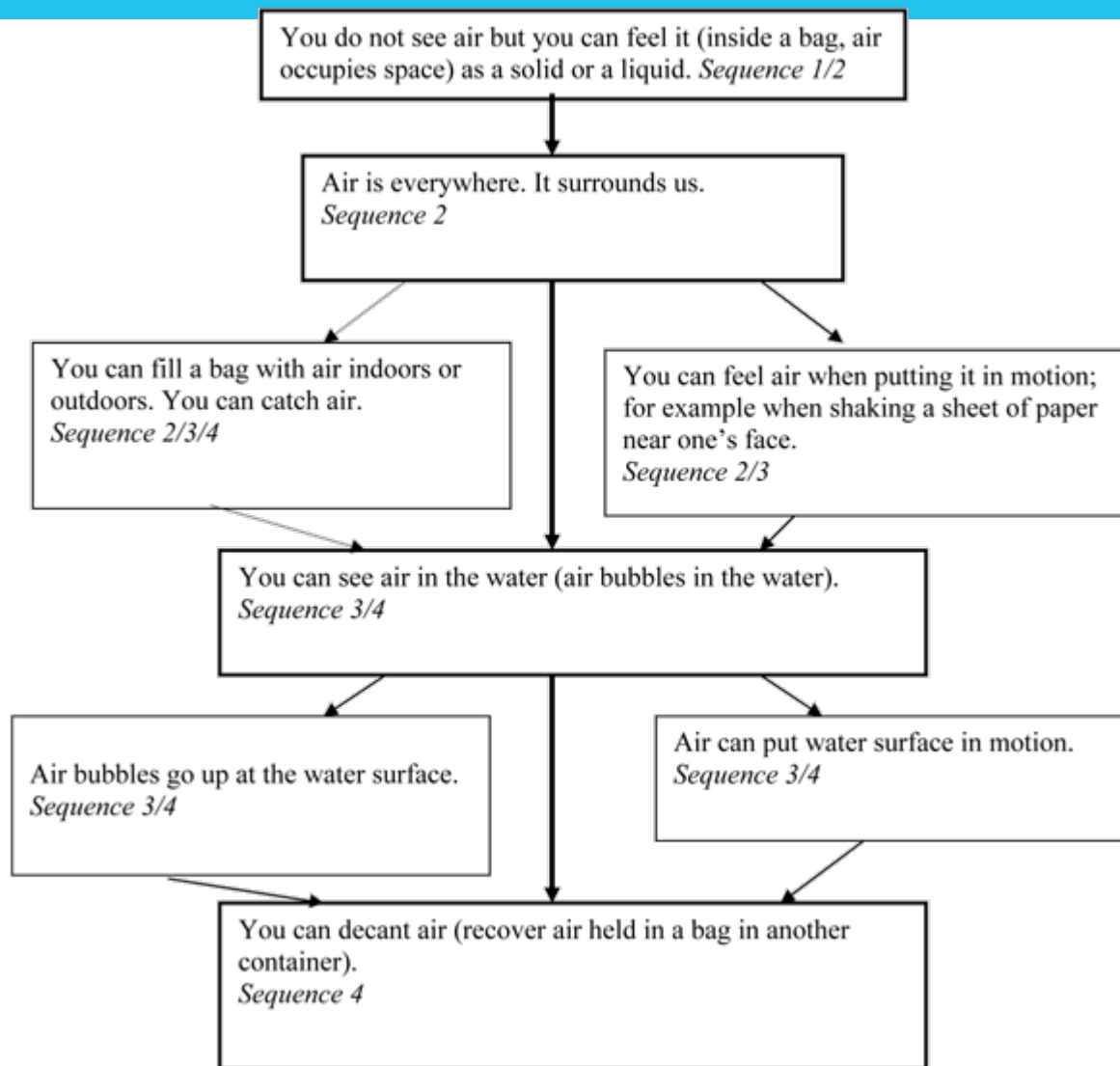
- ⚙️ b/ Design the conceptual storyline of the module "Is air matter?" (15 min)
  - Given the module's storyline, write the conceptual storyline => the skeleton will help you accomplish the task; you can add or remove some rectangles and create new links.
  - Write in the rectangles the concepts (sub concepts) addressed in the module that have to be acquired by the pupils,
  - These concepts have to be formulated in words that a student can understand and employ to explain the studied phenomena (Is air matter?: 8/9 years old),
  - Each formulation (rectangle) has to be linked with a session of the module

*Split the participants in few groups or work in pairs. Work in groups trying to meet the demand. Organize the work on a poster.*

- ⚙️ *Collective exploitation in which each group displays its work and debates with the others. (15 min)*

- ⚙️ c/ Read and discuss the proposition made by the trainer in comparison with the participants' own work. (10 min)

## Conceptual storyline « Is air matter? »



## The usefulness of the conceptual storyline:

- Identify the notions/concepts which will be addressed during a module or a sequence
- Check one's own level of knowledge in a scientific topic; essential stage for a teaching preparation
- Identify the sub concepts (the small ideas) which has to be built by the student in order to acquire the general concept of a module
- Have an organised and structured understanding of the concepts involved in the module (not juxtaposed ones).

### The usefulness of the conceptual storyline to the formative assessment.

- Plan a progressive acquisition of the concepts related to the various sessions/activities and sequences of the module
- Anticipate the difficulties encountered by the students during the activities: coherent articulation between all the activities proposed
- Understand that the concepts' formulations must be adapted to the age of the students. A same concept will be formulated differently according to the teaching level => necessity to plan the concept's evolution all along the primary school and college.

### The usefulness of the conceptual storyline to the formative assessment.

- Understand that the activities taught must lead the students to acquire scientific knowledge in addition to IBSE skills.
- Understand that the writing of the conceptual story line and the planning of the activities evolve each other during the preparation phase
- Prepare the summative assessment and embed the formative one in terms of scientific concepts