

STEM learning

Innovative learning arrangements

Enhancing students' activity

- Most important value in the MINT classroom:
- Students are **active** throughout the whole lesson
- Let the students discover contents themselves
- **Why?:** constructive learning processes foster curiosity, memory performance, and critical analysis of contents

How?

- Start the lesson with a **problem**, a **question** from the students' everyday life or any other interesting picture, quote, etc. that hopefully addresses your students (personally, emotionally)

How?

- Ensure that what they do during the lesson is **meaningful**
- → Introduce the goal of the lesson/ the sequence of lessons
- Let them try **on their own**, let them make mistakes but if necessary, provide them with **scaffolding**

How?

- Let the students **present** their ideas
- Go back to the beginning of the lesson and answer the question/ clarify the issue
- If they know how to give a proper **feedback**, let the students do it
- Give individual feedback
- Summarize the most important aspects

Samples

- ***Mystery*** (discovering issues through group work activity)
- ***Ecosystem practical*** (independent examination of an aquatic ecosystem)
- ***Plickers*** (revising contents digitally) and ***Actionbound*** (discovery quiz)

Mystery

- Method that allows students to discover scientific contents independently
- Start with an issue/ a question and divide your class into groups of max. 4 students
- Create a **meaningful setting** (e.g. a crime scene) that motivates your students to solve a mystery
- Distribute *!!a lot of!!* cards that either help solving the problem or are irrelevant
- Let the students discuss whether the keywords on the cards are part of the process or not
- The students introduce their results

Benefits of mysteries

- Students can solve the problem independently through scaffolding (*cards and other little clues if necessary*)
- They discuss the content on the cards which ensures that they think critically and establish scientific communication skills
(students argue about controverse hypotheses directly and profit from their group members' knowledge and ideas)

Examples of application

- Neuroscience (*biochemical impact of neurotoxins*)
- Ecology (**ecogeographical rules** Allen and Bergmann)
- Evolution (*adaptive radiation, e.g. finches/ radiation of mammals*)
- Chemistry (*acids and bases*)

Ecosystem practical

- Students examine an ecosystem on their own
(and summarize their data and findings in a log)
- In groups of max. 4 students, let them discover their local environment individually
- They will learn to measure and raise data
- They get an insight into specific adaptation of plants and animals and into taxonomy

Benefits of ecosystem practicals

- Students change their usual learning environment and are thus motivated and close to nature
- They get familiar with various skills needed for scientific research, like measuring, raising and analysing data
- They learn to see things in a huge context and learn how organisms depend on each other
- It allows students to escape theory-based lessons and supports autonomous distribution of tasks and thus realizing personal interests
- Makes students aware of anthropological influences on the environment and encourages them to improve the situation

Examples of application

- Forest
- Any aquatic ecosystems
- Tree trunk
- Meadow
- City

Plickers

- www.plickers.com (free version available)
- Setting questions (+pictures) to revise the latest contents/ to check the students' prior knowledge of a topic/ to evaluate a lesson
- Students get cards with QR-codes which are scanned by a smartphone (*→ no need for smartphones/ tablets*)
- The results are immediately available

Actionbound

- App allowing students to discover a topic digitally
(→ *scavenger hunt*)
- Demands detailed preparation
- Makes students work independently and provides them with appropriate scaffolding to do so
- Guides them safely through new learning environments outside the school building
- Group work activity

Actionbound: application

- Examining various ecosystems
- Visiting zoos, farms, honey farms
- Interactive field trips to science-oriented companies
- Discovering the natural environment of the students hometown