Instructions: Fossil Footprints and Detective Work

Recommended Grade: any, adapt as needed

Supplies:

- Educational slideshow “Fossil Types and Preservation”
- Copy of Blackline Footprints 1 and Footprints 2 handouts
- Paper and a pencil to record observations

Learning Outcome:

- Interpret fossil footprints (called trace fossils) as a record of a past event
- Propose a defensible hypothesis for a past geological event

Background:

Dinosaur footprints are called trace fossils, a record of past activity or behaviour. Other kinds of trace fossils include burrows (such as in the physical teaching kit) or feeding trackways, or feces called coprolites.

Interpreting trace fossils can require imagination and ingenuity! Paleontologists are detectives in the sense that they use clues in the rock record to interpret ancient life and events. In this detective work, geological clues can be interpreted in more than one way. Commonly, more than one plausible story may explain the evidence.

Instructions:

1. Project or show Footprints 1. Explain that these are fossilized footprint impressions, found by a paleontologist, on the surface of a rock outcrop that is partially covered. Tell students that the real footprints are about as large as a dinner plate.
2. Let students examine the drawing of Footprints 1 and discuss what they see as a group.
3. Ask students to write down some observations and speculate about what could have happened to make these footprints.
4. Project or show Footprints 2. Explain that these are additional fossilized footprint impressions that have been exposed.
5. Let students examine the drawing of Footprints 2 and discuss what they see as a group.
6. Ask students to write down a new set of observations and interpretations.
7. Ask students the guiding questions: What kind(s) of animals could have made the tracks? Did they walk on two legs or four? What event caused the footprint pattern in Footprints 1 vs. Footprints 2? Were the footprints made at the same time and how

might you know? What can we tell about the size or nature of the animal(s)? How many animals were there?

Ways to take it further:

1. Project Footprints 2 again. You can tell students that dinosaur footprints and other trackways such as crocodile swimtracks are known from northeast B.C. (Tumbler Ridge and Hudson's Hope area).
2. Tell students they reconstructed activity or behaviours from the past based on their analysis of the trackways. They were like detectives in forming defensible explanations. Introduce the concept that as more evidence becomes available, hypotheses must be modified or abandoned. This happens all the time in science!
3. Summarize the key ideas about what dinosaur footprints tell us about past life.
4. Discuss the difference between observation and inference. Ask what evidence supports each explanation.
5. Students had to consider new information with Footprints 2. They will see the need to modify their hypotheses.
6. Discuss further by introducing the following questions:
    a. In what directions did the animals move?
    b. Did they change their speed and direction?
    c. What might have changed the footprint pattern?
    d. Was the land level or irregular?
    e. Was the soil surface moist or dry when the tracks were made?
    f. What kind of rock might the soil/sediment have turned into?
    g. Were the sediments coarse or fine where the tracks were made?
7. Discuss paleo-environments. In the time of the dinosaurs, Earth was much warmer than today.
    a. If dinosaurs made the tracks, what kind of climate may have existed?
    b. If an obstruction prevented animals from seeing each other, could it have been vegetation? What kind of plants might have been around?
    c. What if the footprints widened due to a slope?
    d. What kind of surface conditions could preserve the tracks in sediment that then turned into sedimentary rock?

8. Imaginative students may propose several explanations. The most typical is that two animals met and fought. The evidence is quickened gait due to increasing spacing of the larger footprints, the circular pattern of the mixed trackway ("dinosaur dancefloor"), and disappearance of one set). No reason exists to assume an attack where one dinosaur ate the other dinosaur (get students to explain their evidence). What could a detective look for upon further examination of the site?

9. Another explanation may be that a mother dinosaur picked up a baby dinosaur.

10. Tell students they worked like scientists to use scientific criteria to find, communicate, and defend a preferred explanation.

Curricular Competencies:

The complexity of these competencies varies by grade. These are summarized from the BC Curriculum for brevity.

- Make and record observations of events and living and non-living things, in familiar and unfamiliar settings.
- Make predictions and inferences based on prior and given knowledge.
- Compare observations and predictions to suggest and/or develop possible explanations for findings.

Curricular Content:

- Effects of pushes/pulls on movement **(Kindergarten)**
    - How things move (e.g., bounce, roll, slide)
- Effects of size, shape, and materials on movement **(Kindergarten)**
- Structural features of living things in the local environment **(Grade 1)**
- Local types of earth materials **(Grade 5)**
- The fossil record provides evidence for changes in biodiversity over geological time **(Grade 7)**