Activity 2: Argumentation, The link between data and conclusion
The Yeti case

Accessories:
- Act 2 presentation
- Act 2 Yeti worksheet

Learning goal:
In this activity students learn that observations and assumptions are two different things. That it is important to distinguish these two. Students learn that a conclusion can be structured using Toulmin’s argumentation model in which a link is made between data and claim by means of warrants (support/justification) and likelihood (how sure are you of the claim).

Procedure activity 2:
1. The teacher introduces the activity by telling that in investigation you collect data and draw conclusions which are based upon that data. Such a claim can not simply be stated. To convince others that the conclusions are reliable, a link has to be made between what one has observed and what might be concluded from these observations. One has to use argumentation. During the activity, elements of argumentation are introduced.
2. Students are shown the tricky tracks, and are asked to make a unique observation, meaning that the observation has not been mentioned before. Each observation is written on the whiteboard, without giving any comments (it might be difficult for students to come up with new observations, one might skip).
3. When all students have given an answer, some students might already reflect upon the observations. The teacher addresses the following questions:
   1. Do you agree with all observations? Why (not)?
   2. Can you dispute some of the observations or have a different explanation for an observation? (respond to specifically mentioned observations, such as, how do you know for sure that they have been there at the same time?) The teacher makes a X for disputable observations.
   3. If you would be at the scene, what would you look for? Why?
   4. If we do not agree on what is observed, or how the observation can be explained best, are these then observations? Do you know a different term for these (assumptions)?
4. The next slide is shown and the teacher tells that in science, scientists draw conclusions from data. Such conclusions may contradict with earlier drawn conclusions, there may even be different explanations for the same data. Scientist seek the best of competing explanations. The argumentation is of great importance, you reason how you come from data to conclusion.
5. The next slide will illustrate such an argumentation:
The shape of the two tracks indicate that the patterns are probably coming from two different animals, assumingly birds. As the distance between two consecutive footsteps differ, we may conclude that the velocity changes. From the chaotic track that follows, where one of the two tracks disappears, it seems likely that the animals had a fight. It is unclear whether one of the animals has been eaten or, for example, has flown away.

6 This example shows a line of reasoning, a link between observations and conclusions/explanations. Additionally to this, a likelihood, how certain the conclusions are, is given. What can you still claim using your observations?

7 The teacher asks the students to use this theoretical knowledge in the news article about the Yeti. When the students have finished this assignment, the answers are elaborated by the teacher.

8 As formative assessment a picture is shown. Students are asked to write down three observations (not assumptions!) and write a possible claim in which it is stated that nr 6 is trying to score.

9 Students fill in the general reflection form.