Family edition

Landslide Lab: Reading the Snowpack

Ages 11-14 · about 45 minutes, in one sitting

Your child builds a winter on a mountain in Landslide Lab, reads the snow in a snow pit, and finds a day when the mountain looks quiet but a skier would set off an avalanche. It is avalanche science, not avalanche safety training.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/landslidelab?lesson=reading-the-snowpack&ref=fam-landslidelab-3. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/landslidelab?lesson=reading-the-snowpack&ref=fam-landslidelab-3. A short guide opens over the app. Granite Peak in early winter: a bowl near the top, a gully, and a forested spur. The strip on the right holds five days: Snow, Clear night, Clear night, Heavy snow, Heavy snow.

1. **Days one to three.** Press `Play the next day` three times. The pit in the corner gains a layer of new snow, then frost feathers on top from the clear nights.
2. **Day four.** The heavy snow buries the frost. Nothing slides on its own. By the app's rules the danger is Considerable in all three bands.
3. **Two skiers.** Send a skier `Up the trees`: nothing happens. Then `Across the bowl`: the skier's weight breaks the buried frost 28 cm down, and a size 2.5 slab runs about 336 m.
4. **Day five.** Play the second heavy snow. Six slopes let go on their own, and the danger is High above and near the trees.

> The moment that lands is day four: a quiet mountain where a skier sets off a slab. It answers the warm-up, and it is how most real avalanche accidents happen.

The ideas, in plain words

A snowpack is built in layers, one for each storm or change in the weather. A slab avalanche needs a slope steep enough, usually 30 to 45 degrees; a slab of snow that holds together; a weak layer under it; and a trigger. On clear, cold, calm nights frost feathers called surface hoar grow on the snow. Buried by the next storm, they make a weak layer that can last for weeks.

Most avalanche deaths in North America come from slides the victims or their party triggered. That is why avalanche forecasts describe where a person could set one off, not only where slides will run on their own. Thick trees anchor

the snow, and the trees route in the app keeps to a gentle crest. Avalanches can still run through thin trees and down from the slopes above.

The app builds its snowpack from a few simple rules, the same on every slope facing one way at one height, and its danger ratings come from its own cutoffs. The app is a model of a made-up hill and mountain. It is not a tool for judging a real slope. To go into avalanche terrain, take an avalanche course, read the local avalanche forecast, and carry rescue gear with people trained to use it.

Do it together

1. Open mytekdev.com/try/landslidelab?lesson=reading-the-snowpack&ref=fam-landslidelab-3 together. A short guide opens over the app. Press `Play the next day` and look at the snow pit in the corner.

   > **You'll know it worked when:** A new layer of snow sits on top in the pit.

2. Play the two clear nights. Ask: what grew on top of the snow?

   > **You'll know it worked when:** Frost feathers on top of the pit.

3. Play the heavy snow. Then send a skier `Up the trees`.

   > **You'll know it worked when:** Nothing slid on its own, and the skier was safe.

4. Send a skier `Across the bowl`. Ask: what four things did that avalanche need?

   > **If you get stuck:** A slope steep enough, a slab, a weak layer under it, and a trigger: here, the skier.
   >
   > **You'll know it worked when:** A slab breaks away on the buried frost.

5. Press `Start the winter over`, change the days, and see if a skier can cross the bowl safely.

   > **You'll know it worked when:** Your child can say which day made the difference.

Talk about it

Ask these while you work together. A child who has understood it can answer them without help:

- Point to the weak layer in the pit. Which day made it?
- Why did nothing slide on its own on day four?
- The skier up the trees was safe on the same day. Why?
- Name the four things a slab avalanche needs.

- Would a Warm day after the clear nights change anything? On which slopes?

> The second question is the real test: a child who says the snow was ready and only the trigger was missing has the idea.

For younger and older kids

Younger: For a younger child, play the five days together and talk about the layers like the layers of a sandwich.

Older: For a teenager, pick High school in the level menu and read the strength of each layer in the pit.

Keep going

- Switch the level to high school and read the strength of each layer in the pit.
- Build a winter where the buried frost is still the weak layer a week later, and explain why it lasts.
- Explain why the forecast on day five is High above the trees and only Considerable below them.

Bring it into other subjects

- Math: the skier's slab was 28 cm deep. If a cubic meter of that snow weighs 140 kilograms, how many kilograms of snow sat on each square meter of the weak layer?
- Weather: keep a two-week weather log for a mountain town and say which days would build a weak layer.
- English: write the avalanche forecast for day four in three sentences, for skiers who will read it on a phone.
- Health: read how avalanche rescue gear works, and why it only helps people trained to use it.

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Landslide Lab: Reading the Snowpack
SUBJECTS	Earth science
TIME	45 minutes
WHAT WE DID	Built a winter snowpack a day at a time in a model, read its layers in a snow pit, and explained the four conditions a slab avalanche needs, including a human trigger.
SKILLS PRACTICED	Reading a snow pit; Weather and the snowpack; Natural hazards

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/landslidelab?lesson=reading-the-snowpack

Essential question: What has to be true for a slab avalanche to happen?

Warm-up: What do you think happens to most people caught in avalanches? _____

1. **Vocabulary.** Snowpack, weak layer, slab, surface hoar, trigger: write each in your own words.

2. **The pit on day four.** Draw the pit as a column of layers. Name each layer and the day it came from, and circle the weak layer.

3. **The skiers.** Up the trees: _____. Across the bowl: _____. How deep was the weak layer? ____ cm.

4. **Your own winter.** The days I played: _____. The weak layer: _____. What a skier across the bowl did: _____.

1. On day four nothing slid on its own. Which of the four things was missing until the skier came?

2. Why are buried frost feathers dangerous for days after the storm that buried them?

Quick check

Name: _____

1. Which is NOT one of the four things a slab avalanche needs? (A) a weak layer (B) a slope steep enough (C) a sunny day (D) a trigger

2. Frost feathers grow on top of the snow on (A) warm, windy days (B) clear, cold, calm nights (C) rainy nights

3. A mountain has had no avalanches for two days. Explain why it could still be dangerous to cross a steep slope.

Answers

QUESTION	ANSWER	WHY
1	C	A slab avalanche needs a steep slope, a slab, a weak layer under it, and a trigger.
2	B	Surface hoar grows on clear, cold, calm nights and is buried by the next snowfall.
3	A weak layer can wait for a trigger	A buried weak layer can stay weak for days or weeks; the weight of a person can be the trigger. Saying only that it could be dangerous is half.

If your state or umbrella school asks, this lesson covers NGSS MS-ESS3-2.

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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