Snake Planning: Why Did the Nearest Apple Trap Me?

Plan 35-45 minutes: predict on paper, then check on one projected computer. The local-model lesson needs a computer to run its download. Split advanced calculations across two sessions.

Learning goal

Simulate a move and growth, distinguishing legal now, having a next exit and guaranteed long-term safety.

Before starting

Read coordinates A-E and 1-5, compare distances, and understand that the tail moves on a normal step but stays when eating.

Materials

Two map worksheets, four direction cards, movable body counters and one projected computer.

Class sequence (5 / 10 / 10 / 10 min, plus 5-10 min discussion)

1. Predict (5 min): head B3, body A3,A4, facing right; apples C3,E1; walls C2,D3,C4. Vote right versus up before running.

2. Try (10 min): move right onto C3 on paper. Eating keeps the tail and grows the body. Inspect all four next directions; reversing through the neck is forbidden.

3. Observe (10 min): reset, move up to B2, vacate the tail and count next exits. Compare nearest-food greed, immediate collision filtering and reachable-space planning.

4. Challenge (10 min): use the vacating-tail board and check when entering that cell is legal. A space search freezing the current body is only a conservative snapshot; future occupancy changes.

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Worked example

After eating at C3, the body is C3,B3,A3,A4. Walls block C2,D3,C4 and the neck blocks B3, leaving no next move even though the first move was legal.

Check understanding: ask before showing an answer

After going up to B2, which next cells are legal? Does more reachable space guarantee survival forever?

Expected answers and worksheet check

After up, the body is B2,B3,A3, and the next legal cells are B1 or A2; C2 is a wall and B3 the neck. Eating right keeps the tail and leaves zero exits; up vacates it and leaves two. Tail task: head B2 facing up, body B3,A3,tail A2; turning left into A2 is legal when it vacates on that non-eating step. A larger frozen-body region does not guarantee long-term safety or account for every future growth/timing effect.

Keep the claim within its limits

This is a single-snake board without opponents, pass-through modes or food respawning. Space planning searches a snapshot after each candidate move, not the entire future; the original multiplayer game has simultaneous movement and additional modes.

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Teacher setup

Start the trap map and move right just once. Ask for next exits before stepping again. Reset the same map before comparing strategies.

All policies forbid immediate reversal. Safe filters immediate collisions then minimizes food distance. Space maximizes next-state snapshot area, then food distance. Ties prefer up, right, down, left.

Check and debug

Draw head, body and tail, not just the new head. Ask whether food was eaten before moving the tail, then inspect the new state.

Support and extension

Support: count next exits before discussing search code. Extend: construct a moving-tail case where a frozen snapshot is too conservative, or add two-step simulation and seek another failure.

At home

Draw a board with a legal move that traps the snake next. Ask a parent to predict, then check with movable body counters.

Continue learning

Say It Clearly: Instructions for a Robot / The Line-Up Race: How to Sort Fast / Golden Banana: Can We Trust a Map Made Only by Returners?

Teacher reference (links also on the lesson page)

Lucas Academy: original game: https://snake-lab-coder.lucasacademy.org/?game=snake