Coding with Patterns

Ages 5-9 | Little Tech Explorers

Learn how coders use order, patterns, and fixes through screen-free games.

How to use this guide

Read each section, complete its four lab steps, then answer the questions in the online course. The online progress bar advances only after four correct answers.

Section 1: Put steps in order

LEARNING GOAL: Put steps in order. Your finished work should demonstrate: A tested paper-code sequence.

EXPLAIN THE CONCEPT: A sequence is a set of steps in order. Changing the order can change the result. Think about where you might use this skill in a real or imaginary project. Describe the problem it helps you solve and how you would recognize a successful result.

ORIGINAL PROJECT LAB: 1. Use the provided coding maze from START to TREASURE. 2. Add three spaces between them. 3. Choose the arrows that reach the treasure in the correct order. 4. Follow the arrows with a toy. Finished result: A tested paper-code sequence.

LOOK CLOSELY: A sequence is an ordered set of instructions. We need to know the start and what one instruction means. For this paper activity, one arrow moves a toy one square in the arrow’s direction. The starting square does not count as a move.

FOLLOW AN EXAMPLE: Draw four squares in a row. Put the toy in the first square and treasure in the fourth. Three right arrows move the toy to squares two, three, and four. Counting the start as move one would make the toy stop too soon.

TRY AND EXPLAIN: Say each arrow as you move the toy. Reset it before trying another sequence. Ask a helper to replace one right arrow with a left arrow and predict what changes. Do not move the treasure just to make an incorrect sequence appear right.

Understand with an example

The idea. A sequence gives actions in an order. Some actions depend on an earlier one: a paper character cannot cross a bridge that has not been placed. Acting out the instructions helps you notice those dependencies without needing to type code.

Get ready. Use a paper character, a river picture and a bridge card. Begin with the

character on the left bank and the bridge off the river.

Worked example 1

Follow the reasoning. Follow Place bridge, Move onto bridge, Move to right bank. The bridge is ready before the character uses it. Trace each position with a finger and explain which action makes the next action possible.

Worked example 2: change one thing

Compare the result. Swap the first two instructions. Move onto bridge now refers to a bridge that is not on the river. Stop at that mismatch, restore Place bridge first and replay from the same starting position.

Try one action at a time

1. Set the same starting scene.
2. Arrange the three instruction cards.
3. Act out one instruction at a time.
4. Check that the character reaches the right bank.

A mistake to notice

Pause and check. Do not change the scene halfway through to make a mixed-up sequence appear to work.

Your own small challenge

Predict before trying. Arrange Open box, Put toy inside and Close box so the toy finishes inside a closed box.

Check your thinking

Open box, Put toy inside, Close box is a suitable sequence. Putting the toy inside before opening the closed box does not fit the supplied scene.

Show what you know. Point, draw, demonstrate, type, speak or use your usual communication tool. A trusted adult can help without choosing your answer.

EXPLORE TOGETHER: Draw or point to the important parts of your work. Tell a trusted adult what happened first, next, and last.

SAFETY CHECK: Know what information stays private, stop and ask a trusted adult, and practice kind digital choices. Use pretend data, never real passwords or private information. Stop and ask a trusted adult if anything seems unsafe.

REVIEW QUESTIONS: What is the main idea? Why does the first step matter? How would

you detect a mistake? What evidence proves the result? What would you improve?
Answer in your own words before taking the quiz.
PORTFOLIO REFLECTION: Save a drawing, sanitized screenshot, or short note describing the goal, your approach, your evidence, and one lesson learned. Expected result: A tested paper-code sequence.

Investigate with pictures and choices

A paper robot must open a box before taking a card.
Which action comes first?
1. Say finished
2. Open the box
3. Take a card through the closed box

Worked reasoning

Answer: Open the box. Some actions depend on earlier actions. Show what must happen first.

Try a changed example

Reverse two paper steps and show why the plan changes.

Picture and meaning matches

Sequence: Puts actions in order
Repeat: Uses a pattern again
Debug: Finds and fixes a mistake

Ways to respond

Choose, point, draw, demonstrate, type, speak or use your usual communication tool.
A helper can operate the controls while you choose.

Counting support if useful

Use zero to ten counters or dots. Touch each once. The last count names the quantity. Rearrange the same set and check whether anything was added or removed.
Choose this foundation practice only when it fits the learner goal.
My notes: _____

Hands-on lab

1. Use the provided coding maze from START to TREASURE.

2. Add three spaces between them.

3. Choose the arrows that reach the treasure in the correct order.

4. Follow the arrows with a toy.

Finished result: A tested paper-code sequence.

Check your understanding

1. Which idea best describes Put steps in order?

A. A bug is a mistake that keeps instructions from doing what we planned.

B. It has no purpose in this project.

C. Patterns repeat or grow by a rule.

D. A sequence is a set of steps in order.

2. What is the first step in this lab?

A. Use the provided coding maze from START to TREASURE.

B. Follow the arrows with a toy.

C. Add three spaces between them.

D. Choose the arrows that reach the treasure in the correct order.

3. What should you do after step two?

A. Use the provided coding maze from START to TREASURE.

B. Choose the arrows that reach the treasure in the correct order.

C. Add three spaces between them.

D. Follow the arrows with a toy.

4. Which result shows that your lab is finished?

A. A skipped lab

B. A blank page with no work

C. A tested paper-code sequence.

D. A copied answer without checking it

Answer review

1. D. A sequence is a set of steps in order.

2. A. Start with: Use the provided coding maze from START to TREASURE.

3. B. Step three is: Choose the arrows that reach the treasure in the correct order.

4. C. The goal is: A tested paper-code sequence.

Section 2: Find the pattern

LEARNING GOAL: Find the pattern. Your finished work should demonstrate: Two patterns with rules you can explain.

EXPLAIN THE CONCEPT: Patterns repeat or grow by a rule. Coders notice rules so they can predict what comes next. Think about where you might use this skill in a real or

imaginary project. Describe the problem it helps you solve and how you would recognize a successful result.

ORIGINAL PROJECT LAB: 1. Make a red-blue-red-blue pattern. 2. Say the repeating rule. 3. Add two more items. 4. Create a different pattern for someone to finish. Finished result: Two patterns with rules you can explain.

LOOK CLOSELY: A repeating pattern has a unit that repeats. In red-blue-red-blue, the unit is red-blue. Colors are only one way to show a pattern; shapes, sounds, or movements can work too. Name the rule before predicting the next item.

FOLLOW AN EXAMPLE: Use circle-square-circle-square. After the last square, the repeating unit begins again with a circle. The next two items are circle and square. If you add two circles, the original rule has changed.

TRY AND EXPLAIN: Make a pattern with objects large enough to handle safely. Ask a helper to cover one item and predict it from the repeating unit. Make a different pattern, such as clap-clap-tap, and explain why its unit has three actions instead of two.

Understand with an example

The idea. A repeating pattern has a unit that repeats in the same order. Name or point to the whole repeating unit before predicting what comes next. One different item may signal a change or a mistake, so inspect the given rule rather than guessing from color alone.

Get ready. Lay out large paper cards: red circle, blue square, red circle, blue square. Offer matching shape cards for choices.

Worked example 1

Follow the reasoning. The unit is red circle then blue square. After two complete units, the next card is red circle, followed by blue square. Trace or tap each two-card group to show why.

Worked example 2: change one thing

Compare the result. Change the unit to red circle, red circle, blue square. After red/red/blue/red/red, the next card is blue square. The earlier next-card answer no longer fits the changed rule.

Try one action at a time

1. Point to the first repeating unit.

2. Group the cards using that unit.
3. Choose the next card.
4. Check by adding one more complete unit.

A mistake to notice

Pause and check. A repeating unit can contain repeated shapes; it does not always alternate one shape at a time.

Your own small challenge

Predict before trying. Continue triangle, circle, circle, triangle, circle, circle with the next three shapes.

Check your thinking

The next three are triangle, circle, circle because that three-shape unit repeats.
Pointing to the groups is a valid explanation.
Show what you know. Point, draw, demonstrate, type, speak or use your usual communication tool. A trusted adult can help without choosing your answer.
EXPLORE TOGETHER: Draw or point to the important parts of your work. Tell a trusted adult what happened first, next, and last.
SAFETY CHECK: Know what information stays private, stop and ask a trusted adult, and practice kind digital choices. Use pretend data, never real passwords or private information. Stop and ask a trusted adult if anything seems unsafe.
REVIEW QUESTIONS: What is the main idea? Why does the first step matter? How would you detect a mistake? What evidence proves the result? What would you improve? Answer in your own words before taking the quiz.
PORTFOLIO REFLECTION: Save a drawing, sanitized screenshot, or short note describing the goal, your approach, your evidence, and one lesson learned. Expected result: Two patterns with rules you can explain.

Investigate with pictures and choices

The pattern is circle, square, circle, square.
What comes next?
1. Circle
2. Triangle
3. Two squares

Worked reasoning

Answer: Circle. The two-shape unit repeats in the same order: circle, square, then circle, square again. The next shape starts the unit again with a circle.

Try a changed example

Make an AB pattern with sounds, gestures or two tactile objects.

Picture and meaning matches

Sequence: Puts actions in order

Repeat: Uses a pattern again

Debug: Finds and fixes a mistake

Ways to respond

Choose, point, draw, demonstrate, type, speak or use your usual communication tool.

A helper can operate the controls while you choose.

Counting support if useful

Use zero to ten counters or dots. Touch each once. The last count names the quantity. Rearrange the same set and check whether anything was added or removed.

Choose this foundation practice only when it fits the learner goal.

My notes: _____

Hands-on lab

1. Make a red-blue-red-blue pattern.
2. Say the repeating rule.
3. Add two more items.
4. Create a different pattern for someone to finish.

Finished result: Two patterns with rules you can explain.

Check your understanding

1. Which idea best describes Find the pattern?

A. A sequence is a set of steps in order.

B. Patterns repeat or grow by a rule.

C. A bug is a mistake that keeps instructions from doing what we planned.

D. It has no purpose in this project.

2. What is the first step in this lab?

A. Say the repeating rule.

B. Add two more items.

C. Make a red-blue-red-blue pattern.

D. Create a different pattern for someone to finish.

3. What should you do after step two?

A. Say the repeating rule.

B. Create a different pattern for someone to finish.

C. Make a red-blue-red-blue pattern.

D. Add two more items.

4. Which result shows that your lab is finished?

A. Two patterns with rules you can explain.

B. A copied answer without checking it

C. A skipped lab

D. A blank page with no work

Answer review

1. B. Patterns repeat or grow by a rule.

2. C. Start with: Make a red-blue-red-blue pattern.

3. D. Step three is: Add two more items.

4. A. The goal is: Two patterns with rules you can explain.

Section 3: Fix the bug

LEARNING GOAL: Fix the bug. Your finished work should demonstrate: A maze you debugged successfully.

EXPLAIN THE CONCEPT: A bug is a mistake that keeps instructions from doing what we planned. Debugging means finding and fixing the mistake. Think about where you might use this skill in a real or imaginary project. Describe the problem it helps you solve and how you would recognize a successful result.

ORIGINAL PROJECT LAB: 1. Ask an adult to change one arrow in your maze. 2. Move the toy using the changed instructions. 3. Find where it goes wrong. 4. Fix one arrow and test again. Finished result: A maze you debugged successfully.

LOOK CLOSELY: A bug is a mistake between the instructions and the intended result. Debugging means finding where the result first differs, changing something, and testing again. The first mistake is useful evidence, not something to hide.

FOLLOW AN EXAMPLE: On the four-square route, right-left-right ends in square two, not the treasure square four. The second arrow sends the toy back. Change just that arrow to right, reset to square one, and test right-right-right.

TRY AND EXPLAIN: Draw the wrong arrow and the corrected arrow in a small test note.

Explain which move first went wrong. Keep the same start and treasure when comparing tries; otherwise you will not know whether your correction solved the original problem.

Understand with an example

The idea. A bug is a mismatch between intended and observed behavior. Start again from the same position, follow the instructions exactly and locate the first wrong step. Repairing one instruction makes it easier to see whether the change helped. Get ready. Use a row of four paper spaces numbered 0, 1, 2, 3. Start a character at 0; the goal is space 3.

Worked example 1

Follow the reasoning. The instruction list is Right, Left, Right. Trace 0 -> 1 -> 0 -> 1. It ends at 1, not 3. The second instruction is the first move away from this simple all-right route.

Worked example 2: change one thing

Compare the result. Replace Left with Right and replay from 0: 0 -> 1 -> 2 -> 3. The character now reaches the stated goal. The result supports this repair for this scene; it does not prove every new maze will work.

Try one action at a time

1. Place the character at 0.
2. Trace the original three moves.
3. Change only the second move.
4. Restart and compare the final position.

A mistake to notice

Pause and check. Moving the character to the goal by hand does not demonstrate that the instructions were fixed.

Your own small challenge

Predict before trying. From 0, trace Right, Right, Left. What one move could you change to end at 3?

Check your thinking

Change the final Left to Right, giving 0 -> 1 -> 2 -> 3. Show both traces rather

than moving the goal.
Show what you know. Point, draw, demonstrate, type, speak or use your usual communication tool. A trusted adult can help without choosing your answer.
EXPLORE TOGETHER: Draw or point to the important parts of your work. Tell a trusted adult what happened first, next, and last.
SAFETY CHECK: Know what information stays private, stop and ask a trusted adult, and practice kind digital choices. Use pretend data, never real passwords or private information. Stop and ask a trusted adult if anything seems unsafe.
REVIEW QUESTIONS: What is the main idea? Why does the first step matter? How would you detect a mistake? What evidence proves the result? What would you improve? Answer in your own words before taking the quiz.
PORTFOLIO REFLECTION: Save a drawing, sanitized screenshot, or short note describing the goal, your approach, your evidence, and one lesson learned. Expected result: A maze you debugged successfully.

Investigate with pictures and choices

A path needs two right moves, but the code says right, left.
Which repair matches the plan?
1. Add five left moves
2. Change the goal secretly
3. Change left to right

Worked reasoning

Answer: Change left to right. Compare the observed path with the goal, then change the mistaken instruction.

Try a changed example

Move the goal and write a new plan rather than reusing the old answer.

Picture and meaning matches

Sequence: Puts actions in order
Repeat: Uses a pattern again
Debug: Finds and fixes a mistake

Ways to respond

Choose, point, draw, demonstrate, type, speak or use your usual communication tool.

A helper can operate the controls while you choose.

Counting support if useful

Use zero to ten counters or dots. Touch each once. The last count names the quantity. Rearrange the same set and check whether anything was added or removed. Choose this foundation practice only when it fits the learner goal.

My notes: _____

Hands-on lab

1. Ask an adult to change one arrow in your maze.
2. Move the toy using the changed instructions.
3. Find where it goes wrong.
4. Fix one arrow and test again.

Finished result: A maze you debugged successfully.

Check your understanding

1. Which idea best describes Fix the bug?

A. It has no purpose in this project.

B. A sequence is a set of steps in order.

C. A bug is a mistake that keeps instructions from doing what we planned.

D. Patterns repeat or grow by a rule.

2. What is the first step in this lab?

A. Fix one arrow and test again.

B. Move the toy using the changed instructions.

C. Find where it goes wrong.

D. Ask an adult to change one arrow in your maze.

3. What should you do after step two?

A. Find where it goes wrong.

B. Move the toy using the changed instructions.

C. Fix one arrow and test again.

D. Ask an adult to change one arrow in your maze.

4. Which result shows that your lab is finished?

A. A blank page with no work

B. A maze you debugged successfully.

C. A copied answer without checking it

D. A skipped lab

Answer review

1. C. A bug is a mistake that keeps instructions from doing what we planned.
2. D. Start with: Ask an adult to change one arrow in your maze.
3. A. Step three is: Find where it goes wrong.
4. B. The goal is: A maze you debugged successfully.

Section 4: Guided Project & Worked Examples

COURSE INVESTIGATION: Repeats and an obstacle

YOUR PRACTICE INPUT: A paper character starts at (1,1). Repeat RIGHT then UP twice. Each move changes one grid square.

WHY IT WORKS: The trace is (1,1) -> (2,1) -> (2,2) -> (3,2) -> (3,3). Two repeats contain four individual moves.

PLAN BEFORE YOU ACT: Draw or write the starting state, the question you need to answer, and the evidence you expect to see. A paper trace is acceptable; label it as a prediction unless you actually run a test.

WORK THE CASE: Draw both routes and try UP, UP, RIGHT, RIGHT as a safe alternative. Move a token one step at a time.

COMPARE WITH THE EXPECTED RESULT: The alternative avoids (2,2) and ends at (3,3). The route matters as well as the destination.

EXPLAIN YOUR REASONING: Show the connection between the supplied input, each decision, and your result. If a number, label, or observation differs, return to the first differing step rather than changing several things together.

KEEP YOUR EVIDENCE: Save the initial plan, a drawing or sanitized output, and one explanation of what the result does and does not prove. Use pointing, speech, drawing, typing, or your usual communication method.

LEARNING GOAL: Guided Project & Worked Examples. Your finished work should demonstrate: A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.

EXPLAIN THE CONCEPT: Review the course concepts through two applied examples. Turn clap-clap-stomp into a repeatable instruction sequence. Find the one wrong arrow in a paper maze and debug it. Guided project: Program a paper character through a six-step maze using arrows and repeats. Work with synthetic or fictional information and ask an adult for help when appropriate. Think about where you might use this skill in a real or imaginary project. Describe the problem it helps you solve and how you would recognize a successful result.

ORIGINAL PROJECT LAB: 1. Read both worked examples and explain the reasoning. 2.

Program a paper character through a six-step maze using arrows and repeats. 3. Record the steps you completed and the result you observed. 4. Compare your result to the goal and correct one issue. Finished result: A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.
LOOK CLOSELY: Plan a six-move route on paper. Draw a start, a goal, and enough squares to stay on the map. Agree that arrows mean one square each. A short repeat instruction can describe a repeated group, but first trace every move.
FOLLOW AN EXAMPLE: Draw a grid three columns wide and five rows high. Start at the bottom-left square. Repeat three times: right one, up one would leave the grid on the third right move. That plan needs repair. A valid six-move route is right, right, up, up, up, up to the top-right square.
TRY AND EXPLAIN: Test the valid route with a toy and count six moves. Notice that two rights followed by four ups is different from alternating right and up. Explain the map boundary and why the first plan did not fit it.

Understand with an example

The idea. A coding maze combines a plan, an ordered instruction list and a check of the final position. Keep the starting point and goal visible. A simple paper route can teach the same reasoning as a screen activity without requiring dragging or precise mouse control.
Get ready. Draw a 3-by-3 grid. Use coordinates from (0,0) at bottom left to (2,2) at top right. Start at (0,0), goal at (2,1), with no obstacles.

Worked example 1

Follow the reasoning. Place Right, Right, Up. Trace (0,0) -> (1,0) -> (2,0) -> (2,1). The final square matches the goal. A learner may choose cards while an adult moves the character exactly as instructed.

Worked example 2: change one thing

Compare the result. Change the last instruction to Down. From (2,0), Down leaves this grid. Stop there and mark the boundary problem instead of wrapping to the top. Restore Up and replay from the start.

Try one action at a time

1. Mark the start and goal.
2. Choose the three move cards.

3. Trace every visited square.
4. Compare the last square with the goal.

A mistake to notice

Pause and check. Do not assume every route with three moves ends in the same place; direction matters.

Your own small challenge

Predict before trying. Move the goal to (1,2), keeping the same start and empty grid. Plan three moves.

Check your thinking

Right, Up, Up or Up, Right, Up or Up, Up, Right all reach (1,2) without leaving the grid. More than one correct route exists.

Show what you know. Point, draw, demonstrate, type, speak or use your usual communication tool. A trusted adult can help without choosing your answer.

EXPLORE TOGETHER: Draw or point to the important parts of your work. Tell a trusted adult what happened first, next, and last.

SAFETY CHECK: Know what information stays private, stop and ask a trusted adult, and practice kind digital choices. Use pretend data, never real passwords or private information. Stop and ask a trusted adult if anything seems unsafe.

REVIEW QUESTIONS: What is the main idea? Why does the first step matter? How would you detect a mistake? What evidence proves the result? What would you improve? Answer in your own words before taking the quiz.

PORTFOLIO REFLECTION: Save a drawing, sanitized screenshot, or short note describing the goal, your approach, your evidence, and one lesson learned. Expected result: A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.

Investigate with pictures and choices

Your maze code reaches the star once.

How can you check it again?

1. Remove the star
2. Reset the start and run the same steps
3. Move the start without recording it

Worked reasoning

Answer: Reset the start and run the same steps. A repeatable test uses an explicit start and goal.

Try a changed example

Use a second start and explain which moves need changing.

Picture and meaning matches

Sequence: Puts actions in order

Repeat: Uses a pattern again

Debug: Finds and fixes a mistake

Ways to respond

Choose, point, draw, demonstrate, type, speak or use your usual communication tool. A helper can operate the controls while you choose.

Counting support if useful

Use zero to ten counters or dots. Touch each once. The last count names the quantity. Rearrange the same set and check whether anything was added or removed. Choose this foundation practice only when it fits the learner goal.

My notes: _____

Hands-on lab

1. Read both worked examples and explain the reasoning.
2. Program a paper character through a six-step maze using arrows and repeats.
3. Record the steps you completed and the result you observed.
4. Compare your result to the goal and correct one issue.

Finished result: A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.

Check your understanding

1. Which idea best describes Guided Project & Worked Examples?

A. A sequence is a set of steps in order.

B. Review the course concepts through two applied examples.

C. Patterns repeat or grow by a rule.

D. It has no purpose in this project.

2. What is the first step in this lab?

A. Program a paper character through a six-step maze using arrows and repeats.

B. Record the steps you completed and the result you observed.

C. Read both worked examples and explain the reasoning.

D. Compare your result to the goal and correct one issue.

3. What should you do after step two?

A. Program a paper character through a six-step maze using arrows and repeats.

B. Compare your result to the goal and correct one issue.

C. Read both worked examples and explain the reasoning.

D. Record the steps you completed and the result you observed.

4. Which result shows that your lab is finished?

A. A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.

B. A copied answer without checking it

C. A skipped lab

D. A blank page with no work

Answer review

1. B. Review the course concepts through two applied examples.

2. C. Start with: Read both worked examples and explain the reasoning.

3. D. Step three is: Record the steps you completed and the result you observed.

4. A. The goal is: A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.

Section 5: Independent Challenge & Mastery

INDEPENDENT TRANSFER CASE: Repeats and an obstacle

KEEP THE ORIGINAL BASELINE: A paper character starts at (1,1). Repeat RIGHT then UP twice. Each move changes one grid square.

CHANGE ONE CONDITION: A pretend obstacle occupies (2,2). The original route now meets the obstacle even though its final position is unchanged.

YOUR TASK: Draw both routes and try UP, UP, RIGHT, RIGHT as a safe alternative. Move a token one step at a time.

PREDICT, THEN CHECK: State which part of your original reasoning should remain true and which part must be recalculated or retested. Keep the original and changed results side by side.

REVIEW CRITERIA: The alternative avoids (2,2) and ends at (3,3). The route matters as well as the destination.

MENTOR DISCUSSION: Explain why the changed condition matters. Identify a tempting

wrong conclusion, show the observation that would challenge it, and choose one next test. A statement of uncertainty is better than inventing a result.
PORTFOLIO NOTE: Keep your baseline, changed input, prediction, observed or paper-traced result, explanation, and one improvement. These practice prompts do not replace the course's existing quiz or final assessment.
LEARNING GOAL: Independent Challenge & Mastery. Your finished work should demonstrate: An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.
EXPLAIN THE CONCEPT: Apply what you learned without copying the guided solution. Independent challenge: Create a second route with one intentional bug, then explain and repair it. Safety and responsibility: Never follow a coding instruction that asks for a real password or private detail. Reflect on your work: What did you build or discover? What did you test or change after feedback? What safe or responsible choice did you make? Think about where you might use this skill in a real or imaginary project. Describe the problem it helps you solve and how you would recognize a successful result.
ORIGINAL PROJECT LAB: 1. Explain the challenge and make a short plan. 2. Create a second route with one intentional bug, then explain and repair it. 3. Test the result and record evidence of your work. 4. Review the safety scenario and describe one improvement. Finished result: An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.
LOOK CLOSELY: Create a second map and a short route for a helper. Include one intentional wrong arrow in a clearly labeled practice copy. The helper should know the start, goal, and meaning of each arrow before testing.
FOLLOW AN EXAMPLE: Ask the helper to trace the buggy route exactly rather than guessing what you meant. Stop at the first mismatch. Explain one correction, reset the toy, and retest. If a move leaves the map, record that instead of pretending it landed in a square.
TRY AND EXPLAIN: Show both routes and describe the changed arrow. You may point, move the toy, or explain aloud. A successful program reaches the planned goal using the agreed rules; a longer or prettier route is not automatically more correct.

Understand with an example

The idea. A new route checks whether the learner can plan rather than repeat a

memorized card list. Give a clear start, goal and movement rule. Let the learner predict before acting, then compare the trace and change a move if needed.
Get ready. Use the same 3-by-3 grid. Start at (1,0), goal at (2,2), with only Right and Up moves permitted for this task.

Worked example 1

Follow the reasoning. One plan is Up, Up, Right: (1,0) -> (1,1) -> (1,2) -> (2,2).
The trace records why the route reaches the goal; the card list alone does not show where it started.

Worked example 2: change one thing

Compare the result. Change the start to (0,0) but keep the same three cards. The route ends at (1,2), so it no longer reaches (2,2). Add one Right move and check again.

Try one action at a time

1. Point to the stated starting square.
2. Plan a route before moving.
3. Trace it once without changing the cards.
4. Revise one action and replay if it misses.

A mistake to notice

Pause and check. A correct answer from one starting square may fail after the start changes.

Your own small challenge

Predict before trying. Create a fresh start and goal, choose a route and ask a helper to follow your cards exactly.

Check your thinking

A successful explanation shows the chosen start, each valid move and the goal reached. Accept different routes when the trace follows the declared rules.
Show what you know. Point, draw, demonstrate, type, speak or use your usual communication tool. A trusted adult can help without choosing your answer.
EXPLORE TOGETHER: Draw or point to the important parts of your work. Tell a trusted adult what happened first, next, and last.
SAFETY CHECK: Know what information stays private, stop and ask a trusted adult, and

practice kind digital choices. Use pretend data, never real passwords or private information. Stop and ask a trusted adult if anything seems unsafe.
REVIEW QUESTIONS: What is the main idea? Why does the first step matter? How would you detect a mistake? What evidence proves the result? What would you improve? Answer in your own words before taking the quiz.
PORTFOLIO REFLECTION: Save a drawing, sanitized screenshot, or short note describing the goal, your approach, your evidence, and one lesson learned. Expected result: An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.

Investigate with pictures and choices

The start moves one square farther from the goal.
What should you check?
1. Whether the old sequence still reaches the goal
2. Whether the paper has more colors
3. Whether to call every route correct

Worked reasoning

Answer: Whether the old sequence still reaches the goal. Changed starting conditions can change the required sequence.

Try a changed example

Draw the old and changed routes and compare their endpoints.

Picture and meaning matches

Sequence: Puts actions in order
Repeat: Uses a pattern again
Debug: Finds and fixes a mistake

Ways to respond

Choose, point, draw, demonstrate, type, speak or use your usual communication tool.
A helper can operate the controls while you choose.

Counting support if useful

Use zero to ten counters or dots. Touch each once. The last count names the quantity. Rearrange the same set and check whether anything was added or removed.
Choose this foundation practice only when it fits the learner goal.

My notes: _____

Hands-on lab

1. Explain the challenge and make a short plan.
2. Create a second route with one intentional bug, then explain and repair it.
3. Test the result and record evidence of your work.
4. Review the safety scenario and describe one improvement.

Finished result: An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.

Check your understanding

1. Which idea best describes Independent Challenge & Mastery?

A. It has no purpose in this project.

B. A sequence is a set of steps in order.

C. Apply what you learned without copying the guided solution.

D. Patterns repeat or grow by a rule.

2. What is the first step in this lab?

A. Review the safety scenario and describe one improvement.

B. Create a second route with one intentional bug, then explain and repair it.

C. Test the result and record evidence of your work.

D. Explain the challenge and make a short plan.

3. What should you do after step two?

A. Test the result and record evidence of your work.

B. Create a second route with one intentional bug, then explain and repair it.

C. Review the safety scenario and describe one improvement.

D. Explain the challenge and make a short plan.

4. Which result shows that your lab is finished?

A. A blank page with no work

B. An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.

C. A copied answer without checking it

D. A skipped lab

Answer review

1. C. Apply what you learned without copying the guided solution.
2. D. Start with: Explain the challenge and make a short plan.
3. A. Step three is: Test the result and record evidence of your work.
4. B. The goal is: An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.

Mastery & safe-use plan

Ages 5-9 with a trusted adult nearby

Digital safety: Know what information stays private, stop and ask a trusted adult, and practice kind digital choices.

AI literacy: AI is a computer tool, can make mistakes, and should never replace a trusted adult.

Challenge: Complete a short picture, sorting, pattern, or safety-choice mission.

Portfolio: Save one drawing, map, story, or coding plan and explain it to a trusted adult.

Mastery check: Show the skill, explain one safe choice, and identify who to ask for help.

Project worksheet

My project: Guide a character through a paper coding maze

Who will use or review it? _____

My plan: _____

Checkpoint 1: A tested paper-code sequence.

Checkpoint 2: Two patterns with rules you can explain.

Checkpoint 3: A maze you debugged successfully.

Checkpoint 4: A completed guided project with documented evidence: Maze program, Debugged version, Explanation of the fix.

Checkpoint 5: An independent demonstration with evidence: Maze program, Debugged version, Explanation of the fix.

One thing I tested: _____

One thing I changed after testing: _____

What I learned: _____

Trusted adult or mentor feedback: _____

Family review

Show your finished work to a trusted adult. Explain one thing you learned and one thing you would improve.

Beat IT Kids | For learning at home. Do not put real passwords or private details in practice projects.