Robot Thinking

Ages 5-9 | Little Tech Explorers

Think like a programmer by giving a pretend robot clear instructions.

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: Robots need clear steps

LEARNING GOAL: Robots need clear steps. Your finished work should demonstrate: A four-step robot instruction list.

EXPLAIN THE CONCEPT: A robot follows instructions literally. Clear steps say exactly what action happens 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. Pretend a family member is a robot. 2. Give one instruction to stand up. 3. Give one instruction to take two steps. 4. Notice what happens when an instruction is unclear. Finished result: A four-step robot instruction list.

LOOK CLOSELY: A robot needs instructions with a clear meaning. Go there is unclear unless the robot knows where there is. For our paper robot, forward means one square in the direction its face points; turn means change direction without moving squares.

FOLLOW AN EXAMPLE: Start a toy facing right. Forward, turn left, forward moves one square right and then one square up. The turn changes direction but does not add a move to a new square. Trace the actions slowly with an adult.

TRY AND EXPLAIN: Draw a face or arrow on the toy so its direction is visible. Give two short instructions and predict the last square. Reset before repeating. If a helper interprets a word differently, agree on the rule before changing the route.

Understand with an example

The idea. A pretend robot follows the instructions you agree on, not the intention inside your head. Define what one move means before giving directions. Clear instructions can be shown with arrows or selected cards; speaking and typing are not required to plan a sequence.

Get ready. Draw four large spaces in a row numbered 0 to 3. Start a paper robot at 0. Agree that Right means move one space toward the larger number.

Worked example 1

Follow the reasoning. Give Right, Right. The helper moves 0 -> 1 -> 2, one space for each card. The route is checkable because both people share the meaning of Right.

Worked example 2: change one thing

Compare the result. Replace the two cards with Go over there. The destination is no longer specified by the agreed rule. Ask for a clear destination or move card rather than having the helper guess what was intended.

Try one action at a time

1. Agree what each direction card means.
2. Mark the starting space.
3. Give one move card at a time.
4. Check each new space before the next move.

A mistake to notice

Pause and check. Do not call an instruction wrong simply because it uses a different agreed communication method.

Your own small challenge

Predict before trying. Show two precise instructions that move the robot from 0 to 2.

Check your thinking

Right, Right fits the stated rule. A single instruction such as Move to space 2 can also be precise if that command is added to the agreed language.

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 four-step robot instruction list.

Investigate with pictures and choices

A pretend robot hears go over there.
Which instruction is clearer?
1. Go somewhere nice
2. Be clever
3. Move one square to the right

Worked reasoning

Answer: Move one square to the right. A precise instruction states the action and amount.

Try a changed example

Use a hand gesture or arrow card to show the same instruction.

Picture and meaning matches

Instruction: Names one action clearly
Choice: Uses a stated condition
Goal: Shows where the mission ends

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. Pretend a family member is a robot.

2. Give one instruction to stand up.

3. Give one instruction to take two steps.

4. Notice what happens when an instruction is unclear.

Finished result: A four-step robot instruction list.

Check your understanding

1. Which idea best describes Robots need clear steps?

A. It has no purpose in this project.

B. Sometimes instructions need a choice: if something is true, do one action; otherwise do another.

C. A robot follows instructions literally.

D. Programmers plan, test, notice problems, and improve instructions.

2. What is the first step in this lab?

A. Notice what happens when an instruction is unclear.

B. Give one instruction to stand up.

C. Give one instruction to take two steps.

D. Pretend a family member is a robot.

3. What should you do after step two?

A. Give one instruction to take two steps.

B. Give one instruction to stand up.

C. Notice what happens when an instruction is unclear.

D. Pretend a family member is a robot.

4. Which result shows that your lab is finished?

A. A blank page with no work

B. A four-step robot instruction list.

C. A copied answer without checking it

D. A skipped lab

Answer review

1. C. A robot follows instructions literally.

2. D. Start with: Pretend a family member is a robot.

3. A. Step three is: Give one instruction to take two steps.

4. B. The goal is: A four-step robot instruction list.

Section 2: Choices

LEARNING GOAL: Choices. Your finished work should demonstrate: A working pretend if/otherwise rule.

EXPLAIN THE CONCEPT: Sometimes instructions need a choice: if something is true, do

one action; otherwise do another. 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. Put a toy in front of the pretend robot. 2. Say If there is a toy, stop. 3. Remove the toy and say Otherwise, move one step. 4. Try both situations. Finished result: A working pretend if/otherwise rule.

LOOK CLOSELY: An if rule checks a condition before choosing an action. For this pretend robot, if the next square has an obstacle, stop; otherwise move forward one square. Stopping is an action too. We do not need a real robot or sensor to practice the idea.

FOLLOW AN EXAMPLE: Put a paper block in the next square. Check before moving: obstacle means stop. Remove the block, return to the start, and check again: clear means move. The instruction stays the same while the condition changes.

TRY AND EXPLAIN: Draw a blocked case and a clear case. Explain the different results using the same rule. Do not test obstacle routines near stairs, roads, pets, or real moving equipment. Keep the whole activity on a paper map.

Understand with an example

The idea. A choice rule connects something you can notice with an action. Decide what the pretend robot should do for each picture before you test it. A missing or unfamiliar picture needs a pause-and-ask action so the robot does not guess beyond the rule.

Get ready. Use large red octagon and green arrow cards with words or symbols. Agree that the stop symbol means Stop and the arrow means Go one safe paper space.

Worked example 1

Follow the reasoning. Show the stop symbol. The robot stays on its paper space. Show the arrow next and it moves one space. Symbol and shape provide cues alongside color, so color is not the only way to choose.

Worked example 2: change one thing

Compare the result. Show a blank card. The two-card rule does not say what it means. Choose Pause and ask rather than treating every non-stop picture as permission to move.

Try one action at a time

1. Look at the signal picture.
2. Match it to an agreed rule.
3. Show Stop or one paper move.
4. Pause for a picture not covered by the rule.

A mistake to notice

Pause and check. An unfamiliar signal is not automatically a Go signal.

Your own small challenge

Predict before trying. What should the paper robot do for a new star card when no star rule has been agreed?

Check your thinking

Pause and ask for the rule. The child can show a pause card; the robot should not invent a meaning for the star.

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 working pretend if/otherwise rule.

Investigate with pictures and choices

The rule says if the card is blue, stop. The card is blue.

What does the robot do?

1. Ignore the condition
2. Stop
3. Move because it likes blue

Worked reasoning

Answer: Stop. A stated condition determines which branch runs.

Try a changed example

Change the card to yellow and state what the other branch should do.

Picture and meaning matches

Instruction: Names one action clearly

Choice: Uses a stated condition

Goal: Shows where the mission ends

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. Put a toy in front of the pretend robot.
2. Say If there is a toy, stop.
3. Remove the toy and say Otherwise, move one step.
4. Try both situations.

Finished result: A working pretend if/otherwise rule.

Check your understanding

1. Which idea best describes Choices?

A. It has no purpose in this project.

B. A robot follows instructions literally.

C. Sometimes instructions need a choice: if something is true, do one action; otherwise do another.

D. Programmers plan, test, notice problems, and improve instructions.

2. What is the first step in this lab?

A. Try both situations.

B. Say If there is a toy, stop.

C. Remove the toy and say Otherwise, move one step.

D. Put a toy in front of the pretend robot.

3. What should you do after step two?

A. Remove the toy and say Otherwise, move one step.

B. Say If there is a toy, stop.

C. Try both situations.

D. Put a toy in front of the pretend robot.

4. Which result shows that your lab is finished?

A. A blank page with no work

B. A working pretend if/otherwise rule.

C. A copied answer without checking it

D. A skipped lab

Answer review

1. C. Sometimes instructions need a choice: if something is true, do one action; otherwise do another.

2. D. Start with: Put a toy in front of the pretend robot.

3. A. Step three is: Remove the toy and say Otherwise, move one step.

4. B. The goal is: A working pretend if/otherwise rule.

Section 3: Solve a mission

LEARNING GOAL: Solve a mission. Your finished work should demonstrate: A tested robot mission.

EXPLAIN THE CONCEPT: Programmers plan, test, notice problems, and improve instructions. The first plan does not have to be perfect. 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. Place a start point and goal on the floor. 2. Write or draw a short route. 3. Have the pretend robot follow it. 4. Fix one step if needed and test again. Finished result: A tested robot mission.

LOOK CLOSELY: A mission needs a start, a goal, rules, and a test. Plan a small route before moving the robot. An instruction may be clear but still lead to the wrong goal; testing checks the whole plan.

FOLLOW AN EXAMPLE: Draw a two-by-two grid. Start at the bottom-left facing right and put a parcel at the top-right. Forward, turn left, forward reaches the parcel. If the second instruction is turn right, the next forward move tries to leave the map.

TRY AND EXPLAIN: Trace the good route and then a practice copy with the wrong turn. Reset between tests. Explain why the wrong turn matters and correct just that action. Record the two moves separately from the turn that changed direction.

Understand with an example

The idea. A mission gives a start, goal and movement rules. Break it into small actions, then trace them to see whether the goal is reached. A safe paper simulation lets you test a mistake without driving a real machine or changing a real device. Get ready. Draw a 3-by-3 grid with (0,0) at bottom left. Start a paper robot at (0,1), goal at (2,2), no obstacles.

Worked example 1

Follow the reasoning. Choose Right, Up, Right. Trace (0,1) -> (1,1) -> (1,2) -> (2,2). The robot reaches the goal because each direction changes the intended position by one space.

Worked example 2: change one thing

Compare the result. Move the goal to (2,0). The old route still ends at (2,2). Change Up to Down: (0,1) -> (1,1) -> (1,0) -> (2,0). Recheck the full route from the same start.

Try one action at a time

1. Point to the start and goal.
2. Plan three moves.
3. Trace each move on paper.
4. Compare the ending space with the goal.

A mistake to notice

Pause and check. A plan that worked before may need to change when the mission goal changes.

Your own small challenge

Predict before trying. From (0,1), find another three-move route to (2,0) with two Right cards and one Down card.

Check your thinking

Down, Right, Right and Right, Right, Down both work on the empty grid. Trace the

intermediate spaces to show the route stays inside the grid.
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 robot mission.

Investigate with pictures and choices

The star is two squares right of the robot.
Which plan reaches it?
1. Right, right
2. Left, right
3. Right, left

Worked reasoning

Answer: Right, right. Track the position after each move. Two right moves reach the stated goal.

Try a changed example

Move the star one square up and revise the plan.

Picture and meaning matches

Instruction: Names one action clearly
Choice: Uses a stated condition
Goal: Shows where the mission ends

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. Place a start point and goal on the floor.
2. Write or draw a short route.
3. Have the pretend robot follow it.
4. Fix one step if needed and test again.

Finished result: A tested robot mission.

Check your understanding

1. Which idea best describes Solve a mission?

A. It has no purpose in this project.

B. A robot follows instructions literally.

C. Programmers plan, test, notice problems, and improve instructions.

D. Sometimes instructions need a choice: if something is true, do one action; otherwise do another.

2. What is the first step in this lab?

A. Fix one step if needed and test again.

B. Write or draw a short route.

C. Have the pretend robot follow it.

D. Place a start point and goal on the floor.

3. What should you do after step two?

A. Have the pretend robot follow it.

B. Write or draw a short route.

C. Fix one step if needed and test again.

D. Place a start point and goal on the floor.

4. Which result shows that your lab is finished?

A. A blank page with no work

B. A tested robot mission.

C. A copied answer without checking it

D. A skipped lab

Answer review

1. C. Programmers plan, test, notice problems, and improve instructions.
2. D. Start with: Place a start point and goal on the floor.
3. A. Step three is: Have the pretend robot follow it.
4. B. The goal is: A tested robot mission.

Section 4: Guided Project & Worked Examples

COURSE INVESTIGATION: Instructions need a starting direction

YOUR PRACTICE INPUT: A paper robot faces north on a four-square row. 'Forward, forward' takes it north twice; 'right turn' changes its direction without moving it.

WHY IT WORKS: A turn and a step are different actions. A route must name the starting place and orientation before instructions can be tested.

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: Use a small arrow token. Record place and direction after each action; repair the instructions for the new start.

COMPARE WITH THE EXPECTED RESULT: The explanation distinguishes turning from moving and shows why the initial direction changes the result.

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: Mission map, Instruction algorithm, Debug note.

EXPLAIN THE CONCEPT: Review the course concepts through two applied examples. Give exact steps for moving from a chair to a door. Use an if/otherwise rule when a toy blocks the path. Guided project: Create, test, and debug a robot mission with sequence, choice, and repeat. 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. Create, test, and debug a robot mission with sequence, choice, and repeat. 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: Mission map, Instruction algorithm, Debug note.

LOOK CLOSELY: Build a paper parcel-delivery mission. Mark the start, direction, goal, and one obstacle. Agree what forward, left turn, right turn, and stop mean. Keep the map small enough to trace every action by hand.

FOLLOW AN EXAMPLE: Use the two-by-two mission. First test the route without an obstacle. Then put a block in the next square and apply if blocked, stop. The robot should stop even if that means the parcel is not reached. A safety rule can change the outcome.

TRY AND EXPLAIN: Show a helper the route and the stop rule. Ask them to act as the robot without guessing. Improve any unclear instruction. Keep a note of whether the route reached the parcel or stopped because a square was blocked.

Understand with an example

The idea. A good robot plan includes the command meanings, ordered actions and a clear check. Test the plan with someone who follows the cards literally. When the result differs, use the trace to locate the mismatch rather than asking the helper to quietly correct it.

Get ready. Use a paper 3-by-3 grid, start (0,0), goal (1,2). Right and Up each move one space; the grid has no obstacles.

Worked example 1

Follow the reasoning. Plan Up, Right, Up. A helper traces (0,0) -> (0,1) -> (1,1) -> (1,2). The final space matches the goal, and the trace shows the command list was followed.

Worked example 2: change one thing

Compare the result. The helper accidentally takes two spaces for the first Up. The trace becomes (0,0) -> (0,2), which already differs from the one-space rule. Restart and correct that action before evaluating the rest of the plan.

Try one action at a time

1. State the one-space move rule.
2. Arrange the mission cards.
3. Ask a helper to follow them exactly.
4. Compare the trace and repair the first mismatch.

A mistake to notice

Pause and check. Do not change the rule after seeing a mistake merely to claim the first attempt was correct.

Your own small challenge

Predict before trying. How can you tell a planning mistake from a helper taking a different-sized step?

Check your thinking

Compare the written or pictured card with the observed move. A correct card followed as two spaces is an execution mismatch, while a card pointing the wrong way is a planning issue. Use concrete pointing rather than requiring these terms.
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: Mission map, Instruction algorithm, Debug note.

Investigate with pictures and choices

A teammate follows your robot plan exactly and misses the goal.
What should you inspect?
1. Only the paper color

2. Whether to blame the teammate

3. The start, moves and goal

Worked reasoning

Answer: The start, moves and goal. A trace helps locate the mismatch between plan and result.

Try a changed example

Show each position with a counter before changing a move.

Picture and meaning matches

Instruction: Names one action clearly

Choice: Uses a stated condition

Goal: Shows where the mission ends

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. Create, test, and debug a robot mission with sequence, choice, and repeat.

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: Mission map, Instruction algorithm, Debug note.

Check your understanding

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

A. A robot follows instructions literally.

B. Review the course concepts through two applied examples.

C. Sometimes instructions need a choice: if something is true, do one action;

otherwise do another.

D. It has no purpose in this project.

2. What is the first step in this lab?

A. Create, test, and debug a robot mission with sequence, choice, and repeat.

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. Create, test, and debug a robot mission with sequence, choice, and repeat.

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: Mission map, Instruction algorithm, Debug note.

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: Mission map, Instruction algorithm, Debug note.

Section 5: Independent Challenge & Mastery

INDEPENDENT TRANSFER CASE: Instructions need a starting direction

KEEP THE ORIGINAL BASELINE: A paper robot faces north on a four-square row. ’Forward, forward’ takes it north twice; ’right turn’ changes its direction without moving it.

CHANGE ONE CONDITION: Start the robot facing east while keeping the original instructions. It now finishes somewhere different.

YOUR TASK: Use a small arrow token. Record place and direction after each action; repair the instructions for the new start.

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 explanation distinguishes turning from moving and shows why the initial direction changes the result.
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: Mission map, Instruction algorithm, Debug note.
EXPLAIN THE CONCEPT: Apply what you learned without copying the guided solution. Independent challenge: Shorten a long instruction list using a repeat pattern.
Safety and responsibility: A robot or smart device asks for information it does not need. Ask an adult before sharing. 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. Shorten a long instruction list using a repeat pattern. 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: Mission map, Instruction algorithm, Debug note.
LOOK CLOSELY: Create a new delivery map and ask a helper to follow your instructions. Include a clear case and a blocked case. Use only paper and a small toy so there is no need to control real equipment.
FOLLOW AN EXAMPLE: Before each run, predict the result. If the helper turns the wrong way, check whether your instruction was unclear or the action did not match it. Those are different problems: one needs clearer words, the other needs another careful try.
TRY AND EXPLAIN: Explain the start, one condition, and the evidence from both tests. Success means the program follows the agreed rule, including stopping when blocked.

Do not remove the obstacle during a run just to claim the mission worked.

Understand with an example

The idea. A new mission asks the learner to choose a plan and explain a check. Offer direction cards, a communication board or an adult mover while keeping the planning choices with the learner. One successful route supports this mission only; a new obstacle or start needs another check.

Get ready. Start a paper robot at (1,0) on the 3-by-3 grid. Let the learner choose either (0,2) or (2,2) as the goal.

Worked example 1

Follow the reasoning. For goal (0,2), one plan is Left, Up, Up: (1,0) -> (0,0) -> (0,1) -> (0,2). The learner points to each planned space before the helper moves the robot.

Worked example 2: change one thing

Compare the result. Move the start to (2,0) while keeping that plan. It ends at (1,2), so it misses (0,2). Add one Left in a valid position and trace again. The same cards do not guarantee the same ending from a new start.

Try one action at a time

1. Choose and mark your mission goal.
2. Build a route from the stated start.
3. Ask a helper to follow the route.
4. Show why it worked or revise one move.

A mistake to notice

Pause and check. A faster response is not necessarily better reasoning; allow time to plan and inspect.

Your own small challenge

Predict before trying. Design a mission with a start and goal, then show a different route to the same goal.

Check your thinking

Both routes must follow the agreed moves, remain within the grid and end at the chosen goal. Accept alternatives demonstrated with a complete trace.

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: Mission map, Instruction algorithm, Debug note.

Investigate with pictures and choices

A wall appears on the old path.
What is a useful new test?
1. Calling the wall the goal
2. A revised path that avoids the wall
3. The old path with the wall ignored

Worked reasoning

Answer: A revised path that avoids the wall. A changed constraint needs a changed plan and another test.

Try a changed example

Create two valid routes and compare their lengths.

Picture and meaning matches

Instruction: Names one action clearly
Choice: Uses a stated condition
Goal: Shows where the mission ends

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. Shorten a long instruction list using a repeat pattern.
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: Mission map, Instruction algorithm, Debug note.

Check your understanding

1. Which idea best describes Independent Challenge & Mastery?

A. It has no purpose in this project.

B. A robot follows instructions literally.

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

D. Sometimes instructions need a choice: if something is true, do one action; otherwise do another.

2. What is the first step in this lab?

A. Review the safety scenario and describe one improvement.

B. Shorten a long instruction list using a repeat pattern.

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. Shorten a long instruction list using a repeat pattern.

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: Mission map, Instruction algorithm, Debug note.

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: Mission map, Instruction algorithm, Debug note.

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: Give a pretend robot precise step-by-step instructions

Who will use or review it? _____

My plan: _____

Checkpoint 1: A four-step robot instruction list.

Checkpoint 2: A working pretend if/otherwise rule.

Checkpoint 3: A tested robot mission.

Checkpoint 4: A completed guided project with documented evidence: Mission map, Instruction algorithm, Debug note.

Checkpoint 5: An independent demonstration with evidence: Mission map, Instruction algorithm, Debug note.

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.