Game Design Studio

Ages 13-15 | Tech Builders

Design, test, and improve a playable game idea.

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: Game loops

LEARNING GOAL: Game loops. Your finished work should demonstrate: A playable paper prototype.

EXPLAIN THE CONCEPT: A game loop repeats input, action, and feedback. A player should know what to do and see what happened. 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. Write one goal for a tiny game. 2. Draw what a player can do each turn. 3. Add a clear win or loss signal. 4. Play three pretend turns on paper. Finished result: A playable paper prototype.

EXPLAIN THE MECHANISM: A game loop repeatedly gathers input, updates state, and presents feedback. State includes values such as position, score, and remaining time. A clear loop lets a player connect an action with its consequence. Specify what counts as one update in a paper prototype.

WORKED CASE: In a turn-based paper game, one turn reads a left or right choice, moves one square if allowed, then shows the new position. Starting at square two, right moves to three. If square four is outside the map, another right should produce a clear blocked message rather than an invisible move.

TEST AND JUSTIFY: Trace input, old state, rule, new state, and feedback for two turns. Test both a valid move and a boundary move. Explain the rules without depending on fast animation; a paper trace makes hidden state changes easier to inspect.

GO DEEPER: Identify an assumption, test a safe alternative, and explain the trade-off. Keep a short before-and-after record that someone else could follow.

SAFETY CHECK: Recognize phishing and social engineering, secure accounts, understand privacy settings, and perform cyber labs only with authorization. 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 playable paper prototype.

Investigate with pictures and choices

A game reads input, updates positions and redraws.

What repeats during play?

1. The license statement
2. The game loop
3. Only the title text

Worked reasoning

Answer: The game loop. A loop repeatedly processes the defined game state.

Try a changed example

Trace one frame from a known starting state.

Picture and meaning matches

Game loop: Updates a game repeatedly

Player control: Connects input to an action

Playtest: Checks an observed experience

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. Write one goal for a tiny game.
2. Draw what a player can do each turn.
3. Add a clear win or loss signal.
4. Play three pretend turns on paper.

Finished result: A playable paper prototype.

Check your understanding

1. Which idea best describes Game loops?

A. Iteration means improving a design after testing.

B. It has no purpose in this project.

C. User experience is how a player understands and uses a game.

D. A game loop repeats input, action, and feedback.

2. What is the first step in this lab?

A. Write one goal for a tiny game.

B. Play three pretend turns on paper.

C. Draw what a player can do each turn.

D. Add a clear win or loss signal.

3. What should you do after step two?

A. Write one goal for a tiny game.

B. Add a clear win or loss signal.

C. Draw what a player can do each turn.

D. Play three pretend turns on paper.

4. Which result shows that your lab is finished?

A. A skipped lab

B. A blank page with no work

C. A playable paper prototype.

D. A copied answer without checking it

Answer review

1. D. A game loop repeats input, action, and feedback.
2. A. Start with: Write one goal for a tiny game.
3. B. Step three is: Add a clear win or loss signal.
4. C. The goal is: A playable paper prototype.

Section 2: UX

LEARNING GOAL: UX. Your finished work should demonstrate: A tested set of game instructions.

EXPLAIN THE CONCEPT: User experience is how a player understands and uses a game. Clear instructions and readable controls reduce confusion. 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. Write a two-sentence how-to-play guide. 2. Label every control in your prototype. 3. Ask a friend to try it without extra help. 4. Write down where they got stuck. Finished result: A tested set of game instructions.
EXPLAIN THE MECHANISM: User experience includes understanding goals, learning controls, noticing feedback, and recovering from mistakes. A designer's familiarity can hide confusing instructions. Observe a player's task instead of explaining every action while they test.
WORKED CASE: A prototype labels two controls with identical arrows and gives no goal. A tester repeatedly chooses the wrong action. Add clear labels and one sentence stating the goal, then ask them to repeat the same task without coaching.
TEST AND JUSTIFY: Check text readability, keyboard or alternative control options, and whether feedback relies only on color. Record where the tester hesitates. One successful test does not prove the game works for every player, but it can show whether a particular revision helped.
GO DEEPER: Identify an assumption, test a safe alternative, and explain the trade-off. Keep a short before-and-after record that someone else could follow.
SAFETY CHECK: Recognize phishing and social engineering, secure accounts, understand privacy settings, and perform cyber labs only with authorization. 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 set of game instructions.

Investigate with pictures and choices

A player cannot distinguish two buttons by color.
What improves the control?

1. Add clear text or symbols as well
2. Use color alone more strongly
3. Make the buttons move faster

Worked reasoning

Answer: Add clear text or symbols as well. Do not rely on color as the only information cue.

Try a changed example

Try the controls with a grayscale display.

Picture and meaning matches

Game loop: Updates a game repeatedly

Player control: Connects input to an action

Playtest: Checks an observed experience

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. Write a two-sentence how-to-play guide.
2. Label every control in your prototype.
3. Ask a friend to try it without extra help.
4. Write down where they got stuck.

Finished result: A tested set of game instructions.

Check your understanding

1. Which idea best describes UX?

A. Iteration means improving a design after testing.

B. It has no purpose in this project.

C. A game loop repeats input, action, and feedback.

D. User experience is how a player understands and uses a game.

2. What is the first step in this lab?

A. Write a two-sentence how-to-play guide.

B. Write down where they got stuck.

C. Label every control in your prototype.

D. Ask a friend to try it without extra help.

3. What should you do after step two?

A. Write a two-sentence how-to-play guide.

B. Ask a friend to try it without extra help.

C. Label every control in your prototype.

D. Write down where they got stuck.

4. Which result shows that your lab is finished?

A. A skipped lab

B. A blank page with no work

C. A tested set of game instructions.

D. A copied answer without checking it

Answer review

1. D. User experience is how a player understands and uses a game.

2. A. Start with: Write a two-sentence how-to-play guide.

3. B. Step three is: Ask a friend to try it without extra help.

4. C. The goal is: A tested set of game instructions.

Section 3: Iteration

LEARNING GOAL: Iteration. Your finished work should demonstrate: A revised game with one documented improvement.

EXPLAIN THE CONCEPT: Iteration means improving a design after testing. Change one feature at a time so you know what helped. 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. Pick the most confusing moment from the test. 2. Change one rule or control. 3. Ask the same player to try again. 4. Compare what changed and keep the better version. Finished result: A revised game with one documented improvement.

EXPLAIN THE MECHANISM: Iteration uses evidence to revise a design. State what you expect a change to improve, keep other conditions stable, and retest. Changing speed, controls, scoring, and instructions together makes it hard to know what

caused the result.
WORKED CASE: A tester cannot tell when a checkpoint is collected. Add a visible counter while keeping the same route and controls. Predict that the tester will correctly name the number collected. Retest that exact question before adding sounds or extra rewards.
TEST AND JUSTIFY: Keep a revision log with problem, one change, prediction, observation, and next decision. If the change does not help, say so. Do not invent positive test results because the revised screen looks more polished.
GO DEEPER: Identify an assumption, test a safe alternative, and explain the trade-off. Keep a short before-and-after record that someone else could follow.
SAFETY CHECK: Recognize phishing and social engineering, secure accounts, understand privacy settings, and perform cyber labs only with authorization. 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 revised game with one documented improvement.

Investigate with pictures and choices

Players repeatedly miss the same instruction.
What should guide revision?
1. Only the designer preference
2. Removing all instructions
3. Observed playtest evidence

Worked reasoning

Answer: Observed playtest evidence. A specific observation helps identify a useful change.

Try a changed example

Change one instruction and compare another playtest.

Picture and meaning matches

Game loop: Updates a game repeatedly

Player control: Connects input to an action

Playtest: Checks an observed experience

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. Pick the most confusing moment from the test.
2. Change one rule or control.
3. Ask the same player to try again.
4. Compare what changed and keep the better version.

Finished result: A revised game with one documented improvement.

Check your understanding

1. Which idea best describes Iteration?

A. Iteration means improving a design after testing.

B. User experience is how a player understands and uses a game.

C. It has no purpose in this project.

D. A game loop repeats input, action, and feedback.

2. What is the first step in this lab?

A. Ask the same player to try again.

B. Pick the most confusing moment from the test.

C. Compare what changed and keep the better version.

D. Change one rule or control.

3. What should you do after step two?

A. Compare what changed and keep the better version.

B. Pick the most confusing moment from the test.

C. Ask the same player to try again.

D. Change one rule or control.

4. Which result shows that your lab is finished?

A. A copied answer without checking it

B. A skipped lab

C. A blank page with no work

D. A revised game with one documented improvement.

Answer review

1. A. Iteration means improving a design after testing.
2. B. Start with: Pick the most confusing moment from the test.
3. C. Step three is: Ask the same player to try again.
4. D. The goal is: A revised game with one documented improvement.

Section 4: Guided Project & Worked Examples

COURSE INVESTIGATION: A playtest needs observable criteria

YOUR PRACTICE INPUT: A fictional platform game requires a player to reach a flag in 90 seconds. Two testers finish; a third cannot identify the jump control.

WHY IT WORKS: Completion time alone misses a usability issue. Record the attempted action, feedback, and where the player became stuck.

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: Write a test protocol, retain the original observation, and compare the revised behavior without coaching the tester.

COMPARE WITH THE EXPECTED RESULT: The evaluation reports both completion and control discoverability. A small playtest is useful evidence, not proof for every player.

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: Design brief, Prototype, Playtest matrix, Iteration summary.

EXPLAIN THE CONCEPT: Review the course concepts through two applied examples. Break a game loop into input, state update, feedback, and win/loss conditions. Review a confusing control scheme and propose accessible labels and feedback. Guided project:

Create a playable prototype with documented mechanics, controls, state, scoring, feedback, and test criteria. 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 a playable prototype with documented mechanics, controls, state, scoring, feedback, and test criteria. 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: Design brief, Prototype, Playtest matrix, Iteration summary.

EXPLAIN THE MECHANISM: Build a small paper checkpoint game with a written goal, a turn rule, visible state, and feedback. Choose a route short enough to trace completely. Agree what happens at a boundary and when a checkpoint is collected.

WORKED CASE: A player starts in square one of four. Each right move advances one square. Place a checkpoint in square three and a finish in four. Show a counter when the checkpoint is reached, then a finish message. Do not award the same checkpoint again unless your rule explicitly allows it.

TEST AND JUSTIFY: Test normal movement, a move beyond the finish, and revisiting the checkpoint. Record expected and observed state. Ask a helper to describe the goal and feedback. Revise one confusing element and repeat the same test.

GO DEEPER: Identify an assumption, test a safe alternative, and explain the trade-off. Keep a short before-and-after record that someone else could follow.

SAFETY CHECK: Recognize phishing and social engineering, secure accounts, understand privacy settings, and perform cyber labs only with authorization. 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: Design brief, Prototype, Playtest

matrix, Iteration summary.

Investigate with pictures and choices

Your game has drag-only movement.

What alternative preserves the task?

1. A mandatory timer
2. Tap targets or directional buttons
3. A smaller drag handle

Worked reasoning

Answer: Tap targets or directional buttons. An alternative control can achieve the same action without dragging.

Try a changed example

Compare task completion using both controls.

Picture and meaning matches

Game loop: Updates a game repeatedly

Player control: Connects input to an action

Playtest: Checks an observed experience

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 a playable prototype with documented mechanics, controls, state, scoring, feedback, and test criteria.
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: Design brief, Prototype, Playtest matrix, Iteration summary.

Check your understanding

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

A. A game loop repeats input, action, and feedback.

B. Review the course concepts through two applied examples.

C. User experience is how a player understands and uses a game.

D. It has no purpose in this project.

2. What is the first step in this lab?

A. Create a playable prototype with documented mechanics, controls, state, scoring, feedback, and test criteria.

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 a playable prototype with documented mechanics, controls, state, scoring, feedback, and test criteria.

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: Design brief, Prototype, Playtest matrix, Iteration summary.

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: Design brief, Prototype, Playtest matrix, Iteration summary.

Section 5: Independent Challenge & Mastery

INDEPENDENT TRANSFER CASE: A playtest needs observable criteria

KEEP THE ORIGINAL BASELINE: A fictional platform game requires a player to reach a flag in 90 seconds. Two testers finish; a third cannot identify the jump control.

CHANGE ONE CONDITION: Add a visible control hint, then repeat the same entry scenario with a new tester.
YOUR TASK: Write a test protocol, retain the original observation, and compare the revised behavior without coaching the tester.
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 evaluation reports both completion and control discoverability. A small playtest is useful evidence, not proof for every player.
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: Design brief, Prototype, Playtest matrix, Iteration summary.
EXPLAIN THE CONCEPT: Apply what you learned without copying the guided solution. Independent challenge: Run structured playtests with at least three scenarios, prioritize findings, and implement one measurable improvement. Safety and responsibility: Protect player privacy, avoid manipulative mechanics, and use only original/permitted assets. 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. Run structured playtests with at least three scenarios, prioritize findings, and implement one measurable improvement. 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: Design brief, Prototype, Playtest matrix, Iteration summary.

EXPLAIN THE MECHANISM: Design a different small game and explain the input-state-feedback loop. Choose one intended player task and one measurable observation, such as identifying the current score. Avoid collecting a tester's private details.
WORKED CASE: Compare a version with an unclear score label against a revised label. Use the same short task in both versions and record what the helper understood. Do not claim the label caused every difference in performance from a single informal test.
TEST AND JUSTIFY: Present a rule sheet, state trace, boundary test, and revision record. Explain one tradeoff, such as simpler controls versus more actions. A finished prototype includes known limitations rather than claiming perfect balance or universal accessibility.
GO DEEPER: Identify an assumption, test a safe alternative, and explain the trade-off. Keep a short before-and-after record that someone else could follow.
SAFETY CHECK: Recognize phishing and social engineering, secure accounts, understand privacy settings, and perform cyber labs only with authorization. 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: Design brief, Prototype, Playtest matrix, Iteration summary.

Investigate with pictures and choices

An update changes movement speed and collision rules together.
Why is a failed test harder to diagnose?
1. More than one cause changed
2. Fast games cannot be tested
3. Graphics determine every collision

Worked reasoning

Answer: More than one cause changed. Controlled changes make cause and effect easier

to investigate.

Try a changed example

Revert one change and rerun the same scenario.

Picture and meaning matches

Game loop: Updates a game repeatedly

Player control: Connects input to an action

Playtest: Checks an observed experience

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. Run structured playtests with at least three scenarios, prioritize findings, and implement one measurable improvement.
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: Design brief, Prototype, Playtest matrix, Iteration summary.

Check your understanding

1. Which idea best describes Independent Challenge & Mastery?

A. It has no purpose in this project.

B. A game loop repeats input, action, and feedback.

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

D. User experience is how a player understands and uses a game.

2. What is the first step in this lab?

A. Review the safety scenario and describe one improvement.

B. Run structured playtests with at least three scenarios, prioritize findings, and

implement one measurable improvement.

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. Run structured playtests with at least three scenarios, prioritize findings, and implement one measurable improvement.

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: Design brief, Prototype, Playtest matrix, Iteration summary.

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: Design brief, Prototype, Playtest matrix, Iteration summary.

Mastery & safe-use plan

Ages 13-15

Digital safety: Recognize phishing and social engineering, secure accounts, understand privacy settings, and perform cyber labs only with authorization.

AI literacy: Evaluate bias, hallucinations, deepfakes, privacy risks, attribution, and responsible model use.

Challenge: Complete an independent debugging, defense, data, or design scenario with documented reasoning.

Portfolio: Publish a sanitized project artifact with README-style purpose, steps, screenshots or evidence, and lessons learned.

Mastery check: Explain the design, demonstrate testing, identify a security or ethics risk, and defend one improvement.

Project worksheet

My project: Design and test a playable game

Who will use or review it? _____

My plan: _____

Checkpoint 1: A playable paper prototype.

Checkpoint 2: A tested set of game instructions.

Checkpoint 3: A revised game with one documented improvement.

Checkpoint 4: A completed guided project with documented evidence: Design brief, Prototype, Playtest matrix, Iteration summary.

Checkpoint 5: An independent demonstration with evidence: Design brief, Prototype, Playtest matrix, Iteration summary.

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.