

Lesson 7

Build, Test, Refine: Prototyping Your Solution

 **Instructional Time:**
50–90 minutes

Objectives

Students will:

- Translate their team storyboard into a low-fidelity digital prototype using appropriate tools.
- Apply principles of iteration by designing, testing, and refining early-stage builds.
- Evaluate the alignment of their prototype with their problem statement and audience needs.
- Provide and receive peer feedback using structured tools to improve clarity, effectiveness, and usability.
- Reflect on revisions and next steps to improve their prototype.

Skills for the Future

- People Skills
- System Thinking
- Sensemaking

Project Word Wall

- Prototype
- Iteration
- Test
- Refine

Resources

General

- [Teacher Resource Guide](#)
- [Lesson 7 teacher presentation](#)
- [Student portfolio](#)
- Whiteboard
- Posterboard or digital board (such as [Padlet](#) or [Mentimeter](#))
- Laptops/tablets
- Team problem statement
- Team storyboard
- Design thinking poster
- Prototyping tools (Canva, Adobe Express, Google Sites, etc.)

Videos

- [The Iterative Design Process Explained](#) (3:48)
- [David Kelly-Design as an Iterative Process](#) (1:33)

- [Format Fit Grid](#)
- [Peer Feedback](#)
- [Team Dialogue Protocols](#)
- Digital prototypes

Lesson Plan Summary: The Five Es

Engage: Reconnect With Purpose: Where Are We in the Process? [\(Go to section\)](#)

1. Display the Design Thinking visual (Empathize → Define → Ideate → Prototype → Test). Highlight that students are entering the Prototype + Test phases
 - Student Portfolio Entry: Warm-up Reflection Prompts
 - What problem are we solving, and who are we solving it for?
 - Does our storyboard still clearly reflect our problem and audience? Why or why not?
 - Are we still using the best format or tool for our audience and message?
 - What part of the design thinking process do I feel most confident in? What part might we need to revisit?
 - Interactive Team Check-in
 - Set up a wall or board (physical or digital) with the five phases of the design thinking process.
 - Have teams place a sticky note or emoji where they feel they are in the process and write a brief reason or insight.
2. Teacher Follow-Up Questions

Explore: First Digital Build: Low-Fidelity Prototyping [\(Go to section\)](#)

1. Open Your Storyboard and Problem Statement (located in their student portfolios)
 - Have students choose a platform that supports their format:
 - **Canva:** Infographics, flyers, and slides
 - **Adobe Express:** Quick videos and visual stories
 - **Google Slides:** Campaigns and sequential storytelling
 - **Google Sites:** Mock websites or resource hubs
 - **TikTok or Instagram Reels:** Social media campaigns
 - Start Building (First Draft Mode)
 - Use the Format Fit Grid (in the student portfolio, Lesson 6)
2. Circulate to Provide Feedback
3. Optional Tech-Confidence Boost Mini-Activity: Before building, ask teams to:
 - Name one thing they already know how to do with their chosen tool.
 - Name one thing they're curious to try.
 - Choose a “tech coach” in their group to explore that feature or get help.

Explain: Peer Testing and Structured Feedback [\(Go to section\)](#)

1. Feedback Protocol Options

- Option 1: Glow + Grow + Clarity
 - **Glow:** What is working well? What’s clear, compelling, or creative?
 - **Grow:** What’s confusing or could be stronger? What needs more explanation or polish?
 - **Clarify:** What question do you still have after viewing this prototype?
- Option 2: TAG Method (Tell, Ask, Give)
 - **T: Tell** something you liked
 - **A: Ask** a question you had
 - **G: Give** a suggestion for improvement

2. Giving Peer Feedback

- Prototype Exchange

3. Team Debrief

Elaborate: Refinement in Action: Making Feedback Matter [\(Go to section\)](#)

1. Prioritize Improvements

- Have students group the feedback they received from classmates into three categories:
 - **Must Do:** Feedback that directly affects clarity, accuracy, or audience needs.
 - **Could Do:** Suggestions that would enhance the design but aren’t critical.
 - **Question It:** Feedback the team isn’t sure about or wants to test further.

2. Portfolio Prompt: Have students list the top three changes their team decided upon and explain why they were prioritized.

- **Build time:** Students begin implementing their “Must Do” revisions using their digital tools. Encourage students to:
 - Streamline confusing content.
 - Strengthen visuals or calls to action.
 - Adjust language, color, flow, or structure.

3. Gallery Walk (if time allows)

- Have each team present its biggest revision to another team.
- That team responds with one affirmation and one final insight:

- “Your revision really helped make _____ clearer.”
- “Have you thought about how this change might affect _____?”

Evaluate: Personal Reflection: Exit Ticket [\(Go to section\)](#)

4. Watch Video

- [David Kelly: Design as an Iterative Process](#) (1:33)
- Student discussion

5. Personal Reflection in Student Portfolio

Introduction

Now that student teams have identified a meaningful problem, brainstormed and selected a solution, chosen a format, and created a storyboard, they are ready to begin the initial digital build of their prototype. This lesson will guide students through the process of bringing their ideas to life by translating their storyboard into a low-fidelity digital prototype using real tools. Along the way, they'll apply iterative design principles and test their ideas through structured peer feedback, setting the stage for continued refinement and innovation.

Standards and Practices

Common Core Standards: Grades 9–10

- **W.9–10.5:** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
- **SL.9–10.4:** Present information clearly and logically such that listeners can follow the line of reasoning.
- **W.9–10.6:** Use technology to produce, publish, and collaborate on writing and to interact and collaborate with others.
- **SL.9–10.6:** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Common Core Standards: Grades 11–12

- **W.11–12.5:** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant.
- **SL.11–12.5:** Make strategic use of digital media in presentations to enhance understanding and interest.
- **W.11–12.6:** Use technology to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **SL.11–12.6:** Adapt speech to a variety of contexts and tasks, demonstrating a strong command of formal English when appropriate.

Next Generation Science Standards

- **HS-ETS1-1:** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions.
- **HS-ETS1-2:** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems.
- **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs.

International Society for Technology in Education

- **Innovative Designer (4a, 4b, 4c, 4d):** Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
- **Computational Thinker (5a, 5b, 5c):** Students develop and employ strategies for understanding and solving problems using technology.
- **Creative Communicator (6a, 6b, 6c, 6d):** Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats, and digital media appropriate to their goals.

Teacher Preparation

Preparation

[Differentiation Strategies for Grades 9–12](#)

High school students bring diverse levels of experience with digital tools, iterative design, and peer feedback. Use the strategies at the end of this lesson plan to manage cognitive load, scaffold learning, and increase engagement during prototyping.

Building on the Word Wall

Before each lesson, review existing terms and challenge students to use them in class discussions.

- Encourage students to add relevant key terms from their research and discussions. See the project word wall terms at the end of the lesson for suggestions.
- Add new terms that are integrated into the lesson to your project word wall.

Essential Question: How can we translate our ideas into impactful prototypes that effectively communicate our message and meet user needs?

Engage (5–7 minutes) [\(Back to summary\)](#)

Reconnect With Purpose: Where Are We in the Process?

1. Display the design thinking visual (Empathize → Define → Ideate → Prototype → Test). Emphasize that students are entering the Prototype and Test phases.
2. Have students take 1–2 minutes individually to complete the student portfolio reflection prompts below.
3. Facilitate a brief discussion using the visual as an anchor, allowing students to move a sticky note (physical or digital) to where they *feel* they are in the process, and explain why.

Teacher Script: *Let's pause for a moment and reconnect with the purpose of what we're building. You've done incredible work: you've explored a real-world issue, developed a solution, picked a format, and mapped out your idea. But before we jump into the building today, let's take a step back and ask: Are we still on track? This will help ensure that what we create next is not only creative but also meaningful.*

On the screen, you'll see the phases of the design thinking process. Where do you think your team is right now? Are you confidently in "Prototype," or do you feel like you still need to adjust your "Ideate" or "Define" phase a little bit more? Take a moment to reflect.

1. Play Video: [The Iterative Design Process Explained](#) (3:48)

- While watching the video, have students respond to these prompts in their student portfolios:
 - Why is prototyping important in the design process?
 - Can you think of an example in your own life when iteration helped improve a project or idea?

4. Student Portfolio Entry: Warm-up Reflection: Have each student respond individually to the following prompts before discussing them as a team. If students have access to a video recording app, consider asking them to capture their reflections on video. Prompts:

- What problem are we solving, and who are we solving it for?
- Does our storyboard still clearly reflect our problem and audience? Why or why not?
- Are we still using the best format or tool for our audience and message?
- What part of the design thinking process do I feel most confident in? What part might we need to revisit?

5. Interactive Team Check-in: Set up a wall or board (physical or digital) with the five design thinking phases. Have each team:

- Place a sticky note or emoji (digital tools work great!) where they *feel* they are in the process.
- Write a brief reason or insight: "Still revisiting our audience needs," or "Ready to test early build."

Teacher Follow-Up Questions:

- What patterns do we see across teams?
- Are there teams that feel like they're between phases? What does that tell us about iteration?
- How might your reflection influence what you focus on during prototype building today?

Explore (20–30 minutes) [\(Back to summary\)](#)

First Digital Build: Low-Fidelity Prototyping

Teacher Setup and Timing Notes

Timing May Vary: Students choosing more complex formats, such as video, animation, or interactive sites, may require extended build time or follow-up sessions. Encourage flexible pacing, prioritizing creative momentum over completed polish.

Teacher Tip: Remind students that *low-fidelity* does not mean "bad"—it means "draft mode." Encourage them to capture the essence of their solution idea, even if visuals are rough or content is incomplete.

Encourage Risk-Taking: Many students may hesitate to start because they want their first build to be "perfect." Instead, normalize messy first drafts and frame this session as a safe space to experiment and learn from mistakes.

Teacher Script: *You’ve already done the heavy lifting—your team has a strong problem statement, a compelling storyboard, and a format that fits your audience. Now it’s time to start building. This is your first digital draft, not the final product, so give yourself permission to build quickly and test early. Just like all great creators, you’ll refine as you go. Whether you’re making a TikTok, a Canva infographic, or a Google Site, the most important thing is to clearly communicate your core message to your audience. So let’s get building—experiment, revise, and most of all, enjoy the process.*

1. Open Your Storyboard and Problem Statement:

Have students start by reviewing what they planned to communicate, and who their solution is for. They can locate this in their student portfolios.

2. Select the Right Tool:

Instruct students to choose a platform that best supports their format:

- **Canva:** Infographics, flyers, and slides
- **Adobe Express:** Quick videos and visual stories
- **Google Slides:** Campaigns and sequential storytelling
- **Google Sites:** Mock websites or resource hubs
- **TikTok or Instagram Reels:** Social media campaigns

3. Start Building (First Draft Mode):

- Focus on structure over detail.
- Use placeholder images or sample text (“Lorem ipsum”) where needed.
- Prioritize clarity and flow, not final fonts or color palettes.

4. Use the Format Fit Grid (in the student portfolio, Lesson 6):

- Have students briefly revisit their Format Fit Grid and ask themselves, “Are you still confident in your tool choice?”

5. Circulates to Provide Feedback

- Is your message clear so far? What evidence demonstrates that your question is clear?
- How is your chosen format effective?
- Do you need support with the tool itself?
- Identify the questions that prompted the biggest changes in the prototypes.

Guiding Questions (for teams and check-ins):

- What part of your storyboard has been easiest to build? What's been hardest?
- Is your digital build staying true to your problem statement?
- What's one part of your message that could be clearer or simpler?
- Do you have a clear, easy-to-identify call to action (CTA)?
- What support do you need with the tool you're using?

Encouraging Creative Confidence: Overcoming Fear of Tech Tools

Teacher Script: *Prototypes are like rough drafts—they're meant to be imperfect. You don't have to be a tech wizard to communicate a great idea. Just start with what you know. If something's tricky, ask me or your teammates for help. Trying something new is part of the design process!*

Optional Tech-Confidence Boost Mini-Activity (2–3 min.)

Before students begin building, ask teams to:

- Name one thing they already know how to do with their chosen tool.
- Name one thing they're curious to try.
- Choose a "tech coach" in their group to explore that feature or get help.

Explain (15–20 minutes) ([Back to summary](#))**Peer Testing and Structured Feedback**

Teacher Script: *Even professional designers and engineers don't build alone. They test their ideas early and often. That's what we're doing today. You'll share your first draft prototype with another team and offer each other clear, respectful, and helpful feedback. This isn't about saying whether an idea is "good" or "bad," it's about understanding how to make it work better for the people it's meant to help. Think of feedback as a way to build something with your audience, not just for them.*

Feedback Mindset Framing (share with students): Your prototype isn't your baby, it's your experiment. You're building something for a user or community. That means it must work for them, not just make sense to you.

Feedback Protocol Options (choose one or rotate both):**1. Option 1: Glow + Grow + Clarify**

Print the Peer Feedback Protocols or display it on screen.

- **Glow:** What is working well? What's clear, compelling, or creative?
- **Grow:** What's confusing or could be stronger? What needs more explanation or polish?
- **Clarify:** What question do you still have after viewing this prototype?

Have students write one comment in each category and share aloud or post them to a feedback board.

2. Option 2: TAG Method (Tell, Ask, Give)

Great for younger students or for a more casual tone:

- **T: Tell** something you liked
- **A: Ask** a question you had
- **G: Give** a suggestion for improvement

Giving Peer Feedback

1. Prototype Exchange (5 min.):

Pair teams and have them share their digital prototypes (in-progress). Teams will take turns reviewing and providing feedback using the selected protocol.

2. Sticky Note Exit (3 min.):

Have students individually write one "praise" (Glow or Tell) and one "suggestion" (Grow or Give) on sticky notes (physical or digital). For digital options, consider Padlet, Figjam, or Miro as options to collect peer feedback.

3. Team Debrief (2–4 min.):

Instruct each team to review their notes and highlight:

- One strength to keep or build on.
 - One revision or question to explore further.
 - One thing to test or change before the next round.
4. Have students take pictures of the feedback they received (either the collection of sticky notes or of the digital board) and upload them to their student portfolios.

Teacher Script (1 min.): *You've taken the first step in testing your solution. The best ideas are rarely perfect on the first try; they grow stronger through feedback. As we move into our next session, you'll have time to revise, build further, and test again. Keep thinking like a designer: stay open, stay curious, and keep iterating.*

Elaborate (15–20 minutes) [\(Back to summary\)](#)

Refinement in Action: Making Feedback Matter

Teacher Script: *Now that you've tested your prototype and received feedback, it's time to refine. But not every piece of feedback is equal. You'll need to think critically about what's most important, what aligns with your goals, and what will make the biggest difference to your audience. This is where design thinking turns into systems thinking. A small change in your prototype might change the way your whole message flows. Think about your prototype like a system: how do its parts work together? Are there weak spots? Strong connections? Let's refine with purpose.*

Teacher Tip: Encourage students to:

- Review their prototype as a full system, not just isolated components.
- Discuss what kind of experience they want their user to have.
- Utilize team dialogue protocols to ensure equitable participation and thoughtful consideration of feedback.

Prioritize Improvements (5 min.)

1. Have students group the feedback they received from classmates into three categories:
 - **Must Do:** Feedback that directly affects clarity, accuracy, or audience needs.
 - **Could Do:** Suggestions that would enhance the design but aren't critical.
 - **Question It:** Feedback the team isn't sure about or wants to test further.
2. Instruct students to list the top three changes their teams decided upon and explain why they were prioritized.

Make It Better (5–7 min.)

Build Time: Have students begin implementing their “Must Do” revisions using their digital tools. Encourage them to:

- Streamline confusing content.
- Strengthen visuals or calls to action.
- Adjust language, color, flow, or structure.

Teacher Tip: Remind teams to periodically zoom out and ask themselves, “Are all parts of our prototype still supporting the problem we set out to solve?”

Gallery Walk (if time allows):

- Have each team present their biggest revision to another team.
- That team responds with one affirmation and one final insight:
 - “Your revision really helped make _____ clearer.”
 - “Have you thought about how this change might affect _____?”

Teacher Script: *You're building with purpose now, not just based on your own ideas, but in response to feedback, insights, and the needs of your audience. That's what real-world innovation looks like. Keep in mind that every improvement you make gets you closer to impact.*

Evaluate (10–12 minutes) [\(Back to summary\)](#)

Teacher Script: *Every great product, campaign, or message you've ever seen has been through dozens—sometimes hundreds—of iterations. Designers don't expect to get it right the first time. What makes their work powerful is how they respond to feedback, learn from it, and improve. You've done that today. You built a draft, gained peer insight, and began refining your work. Now let's take a moment to connect what you're doing here to what professionals do every day.*

Watch the Video (2 min.): [David Kelly-Design as an Iterative Process \(1:33\)](#)

After watching this video of David Kelly, one of the originators of design thinking from Stanford University, have students discuss the following questions:

- What mindset or approach do professional designers bring to the prototyping process?

- How is their experience similar to or different from ours today?

Personal Reflection: Exit Ticket (5–6 min.)

Prompt students to answer the following questions in their student portfolios:

- How did feedback help you see your work in a new way?
- What part of the process felt most rewarding? What part was most challenging?

Teacher Script: *You're now deep in the design thinking process, and what you've done today mirrors the exact same process used by product developers, engineers, and artists around the world. The next time you use an app or interact with a great campaign, remember: it started with a rough idea and was shaped by feedback, testing, and courage to improve. You're doing the same.*

Project Word Wall

Introduce key vocabulary to establish a strong foundation for discussion and research. Have students define and discuss the following:

- **Prototype:** An early version of a product, campaign, or tool created to test and refine ideas before final development
- **Iteration:** is the process of repeating a set of actions or steps to improve a product, solution, or outcome.
- **Test:** Trying out your prototype with real users to see what works and what needs to change.
- **Refine:** To improve or make something better by adjusting the small details based on feedback.

Integrate Skills for the Future

Prior to each lesson, add the durable skills students will develop and encourage reflection on how they apply these skills in their project work.

- **People Skills:** Behavioral interactions and behaviors to understand and manage the feelings of other individuals in team and other group settings to achieve individual or collective goals and develop productive working relationships to minimize conflict and maximize rapport.
- **System Thinking:** Mental analyses of any system in order to understand system elements, the interconnections among the elements that drive the system to work as a whole, and how its constituent elements function both individually and in relation to each other.
- **Sensemaking:** Gathering and interpreting data to rationalize and understand personal experiences and the world they live in, and develop a personal sense of meaning.

Differentiation Strategies for Grades 9–12 [\(Back to top\)](#)

Students across high school grades have varying levels of experience with research, data analysis, and user-centered inquiry. Use the following strategies to adjust cognitive load, scaffold learning, and encourage deeper engagement.

Grade 9: Building Confidence Through Drafting and Feedback

Cognitive Focus: Developing foundational prototyping skills through experimentation and guided revision.

Objective: Help students discover how their interests and skills can influence the format they choose for their solution.

Objective: Help students gain comfort with early-stage digital creation and build confidence by learning how to give and receive constructive feedback.

- **Messy Drafts Are Okay:** Normalize imperfection by showcasing real-world “rough drafts” of apps, posters, or tools.
- **Guided Tool Walkthroughs:** Provide short tutorials or step-by-step instructions for common platforms (e.g., Canva, Slides).
- **Mini Feedback Clinics:** Use fishbowl-style peer feedback sessions with sentence stems (e.g., “I liked when you...” or “Have you thought about...”).
- **Sticky Note Revisions:** Have students record one “quick fix” and one “longer-term goal” on sticky notes after receiving feedback.

Grade 10: Connecting Iteration to Purpose and Audience

Cognitive Focus: Strengthening the alignment between design decisions and audience/user needs.

Objective: Support students in revising prototypes with intention by using feedback to improve message clarity and functionality.

- **Alignment Check:** Have students revisit their problem statement and audience profile before editing to ensure relevance.
- **Feedback Prioritization Grid:** Have students sort peer feedback into categories (urgent, important, and nice-to-have) to focus revisions.
- **Before and After Slides:** Have teams capture screenshots or sketches of a prototype “before” and “after” feedback to reflect on impact.
- **Real-World Parallels:** Provide examples of how companies revise products based on user testing (e.g., UX redesign case studies).

Grade 11: Deepening Evaluation Through User Testing

Cognitive Focus: Critically analyzing the effectiveness of design choices through structured user-centered evaluation.

Objective: Encourage students to test their prototype with diverse users and iterate based on patterns in feedback.

- **Mini User Testing Sessions:** Students conduct short usability tests with classmates and log patterns across responses.
- **Feedback Mapping:** Create a visual map that shows feedback from different sources (e.g., peer, teacher, “user”) and how it informs revisions.
- **Feature Rationale Exercise:** Have teams justify each major prototype element by answering: “Why this image? Why this headline?”
- **Pro-Grade Criteria:** Introduce basic professional design criteria (e.g., accessibility, simplicity, consistency) and encourage self-evaluation.

Grade 12: Iterating Toward Real-World Viability

Cognitive Focus: Applying advanced design thinking to create a polished prototype that reflects industry expectations.

Objective: Prepare students to refine and finalize their prototype with professional polish, audience empathy, and implementation readiness.

- **External Feedback Loop:** Invite feedback from teachers outside the class or peers from other grade levels.
- **Launch Simulation:** Ask students to imagine launching their prototype next week and identify what needs to be completed, clear, or convincing.
- **Design Portfolio Entry:** Have teams begin documenting their prototype as part of a design portfolio, including revision history and user insights.
- **Next-Step Mapping:** Have students draft a plan for final development, marketing, or presentation of their prototype.