Assignment Framework: Thinking in Systems

Title: *“Solving Big Problems With Better Thinking”*

Assignment Overview:

Solving Big Problems With Better Thinking

What This Is

This is a multi-part, visual-thinking-based project where students explore real-world problems, map out how they think, and design thoughtful solutions—not just to solve, but to understand *why, how,* and *what could go wrong or be done better.*

At the core is a living mind map that grows over time. Around it, students will:

- Track their thought process
- Consider unintended effects
- Explore alternatives
- Reflect on what they don’t know yet
- Build their *architecture of thinking*

This assignment values exploration over perfection, curiosity over answers, and thoughtfulness over speed.

How It Works

1. Choose a big, real-world problem (from the list or student-generated)
2. Build a mind map starting with:
    - Problem statement
    - Research and inspirations
    - Effects (1st, 2nd, 3rd order)
    - Proposal ideas (with tradeoffs, gaps, challenges)
    - Assumptions & unknowns
3. Track sleep and progress
4. Write reflection paragraphs
5. (Optional) Present to peers, parents, or local community

Suggested Big Problems (Kid-Appropriate, Systems-Rich)

Students choose one of the problem statements

These are designed to provoke systems-level exploration, ethical questions, and creative solution design—while remaining age-accessible.

🌎 Environment

- Plastic waste in oceans is harming marine life by entangling animals and being mistaken for food. It's difficult to remove without disrupting the ecosystem.
- Cities experience dangerous heatwaves, especially in areas with lots of pavement and little shade. This can make people sick and increase energy use.
- Roads and development often cut through animal habitats, which can lead to wildlife being injured or killed by cars. Over time, this also splits habitats into

smaller, disconnected pieces, which reduces how far animals can travel to find food, mates, or shelter. When ecosystems become too small or fragmented, some species—like bison or large predators—can't survive there anymore.

🏙️ Cities & Design

- Many homes are not built to withstand heavy storms or flooding, which can put families and property at risk.
- Most cities use more energy than they produce, and depend on distant power sources that require fuel and infrastructure.
- Some urban parks are underused or have limited plant life, making them less helpful for both people and nature.

🧍 Health & Well-being

- Some people have trouble focusing or staying calm, which may be linked to overstimulation, lack of sleep, or how daily routines are structured.
- Most cities are not designed with children's emotional needs in mind, which may affect how safe or comfortable they feel in public spaces.

🚮 Waste & Materials

- Restaurants often throw away large amounts of edible food, even while others don't have enough to eat. Food waste also creates environmental problems.
- Many products are thrown away after being used, which fills landfills and wastes materials that could be reused.
- Trash can blow out of bins and end up in rivers or oceans, where it harms animals and ecosystems.

⚡ Materials & Infrastructure

- Copper is becoming harder to find, and we use copper in electrical wiring and power systems around the world.
- The world is using large amounts of lithium, a metal found in rechargeable batteries used in electronics and electric vehicles.

🌧️ Flooding & Water Systems

- Sewer systems can overflow during heavy rain, causing dirty water to back up into streets and waterways.
- Homes in flood-prone areas are sometimes damaged or washed away, especially during major storms.

🧠 Learning & Technology

- Traditional school methods don't always support how different students learn, which can make it harder for some kids to understand or feel confident.
- Homework is sometimes stressful and may not always help with learning, especially when students don't get feedback or support.
- Many learning tools rely on screens, which can reduce physical activity and change how kids sleep or concentrate.

🌍 Systems & Global Supply

- Food and other essential supplies often move through long global supply chains. This uses fuel, creates pollution, and can break down when something unexpected happens.

🧩 Open-Ended or Hypothetical Systems

- Cars that use gasoline release pollution into the air, which can contribute to climate change and health issues.
- Human development often disrupts animal habitats, which can lead to less space and fewer resources for wildlife.

- Most cities import food from far away, which requires shipping, fuel, and packaging, and can make local food access harder.

🧼 **Suggested Teacher Prompt (Optional for Framing)**

- “These are not problems you have to fix. They’re situations happening in the world today. Your job is to explore what’s going on, think about what it connects to, and share how you would try to help—if you were in charge.”

✅ **Teacher Options**

- Let students generate their own
- Mix structured prompts + open-ended freedom

Learning Goals

- Develop **systems-level thinking**
- Practice **structured creativity** and **ethical foresight**
- Build **cognitive self-awareness** through reflection and sleep tracking
- Learn how to trace **inspiration**, consider **tradeoffs**, and design **multi-path solutions**
- Use writing to support thinking—not replace it

Developmental Rationale

This assignment emphasizes:

- **Metacognition** (thinking about your thinking)
- **Causal reasoning** (if I do this, then what?)
- **Cross-domain integration** (science, ethics, health, literacy, design)
- **Source awareness + critical humility** (where ideas come from, what we don't know)
- **Executive function** (planning, comparing, iterating)

Designed to **respect young learners' cognitive agency**, while equipping teachers to scaffold rich but manageable thinking tasks.

Deliverables

All work is centered around **one large evolving mind map** (or interconnected maps) supported by small writing components. This is a **thinking-first, writing-supported** structure.

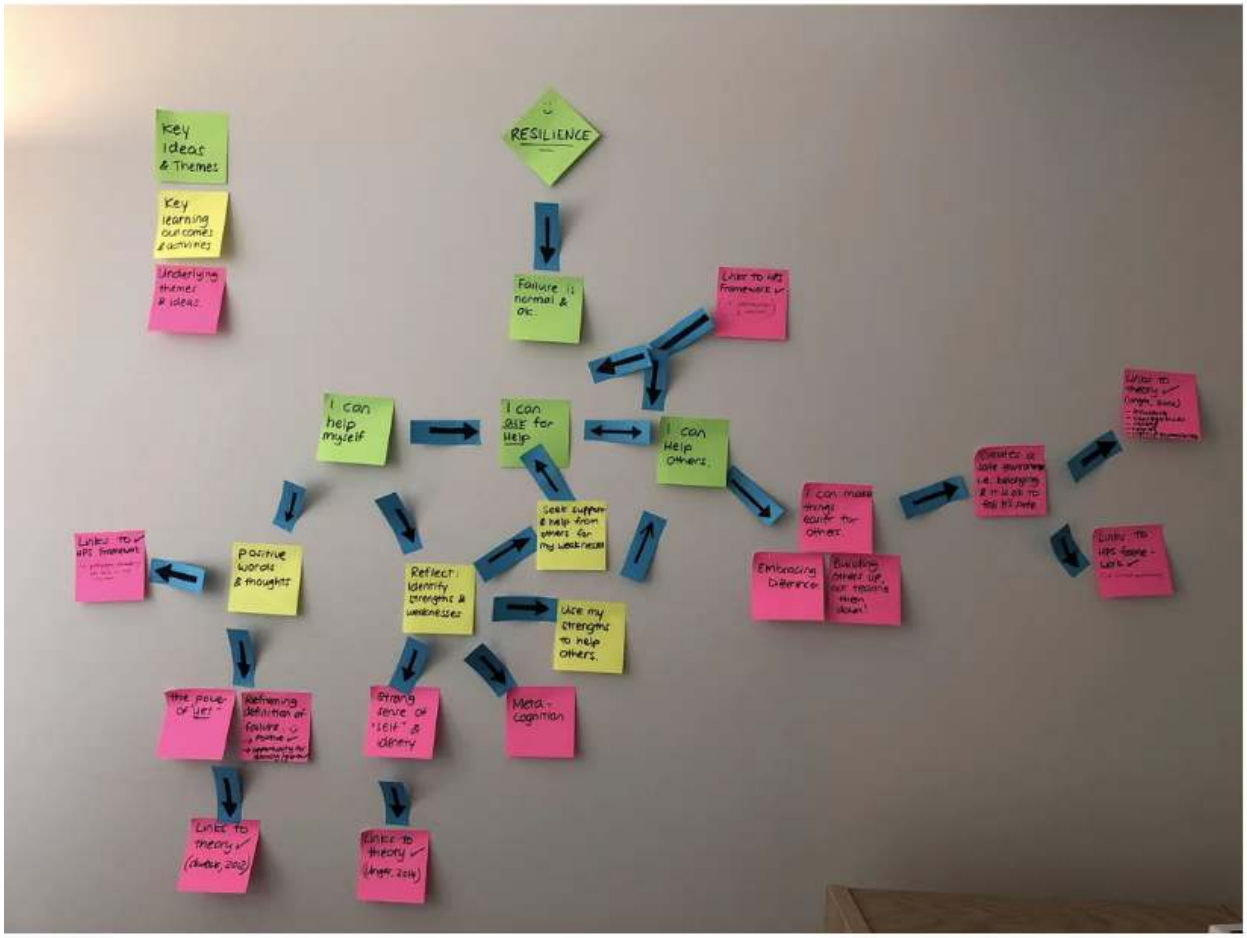
1. Mind Map

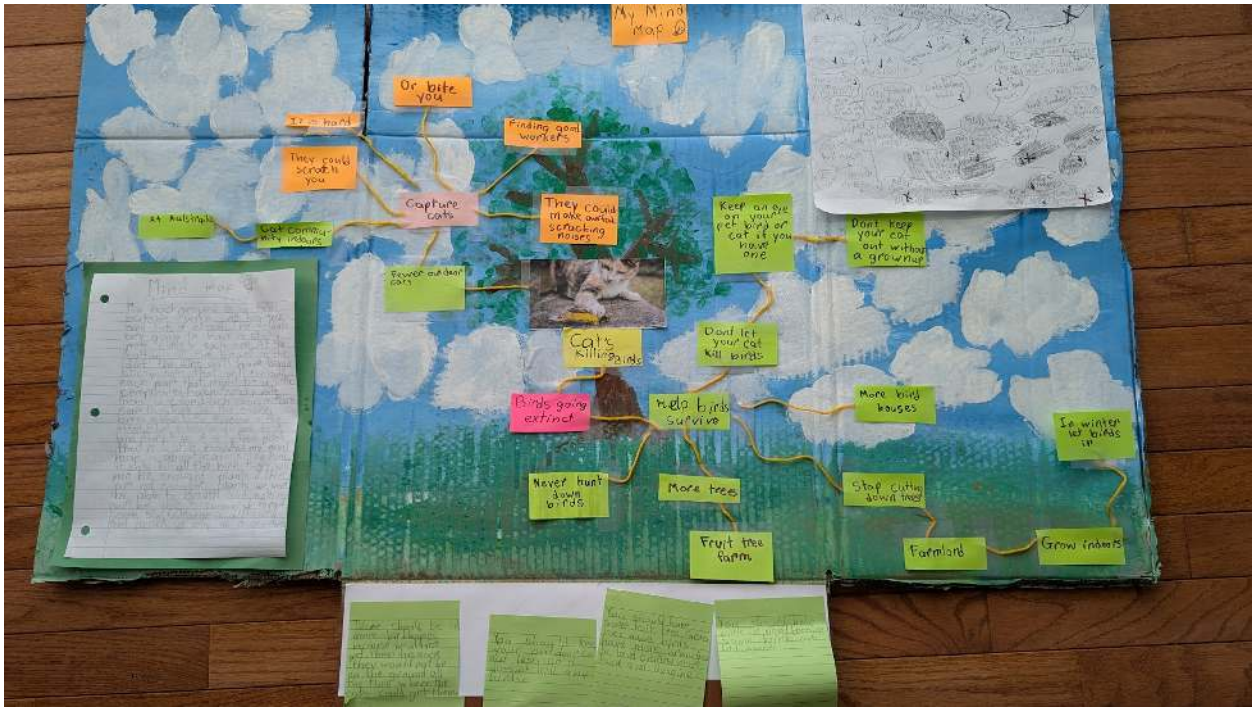
Core of the assignment

Each section below is built on or added to the mind map using:

- Nodes (main concepts)
- Arrows (cause/effect, comparisons)
- Icons, color, emoji, or mini drawings
- Optional: stickers, yarn lines, or branch labels

Example:


Key Ideas & Themes
Key learning outcomes & activities
Underlying themes & ideas
RESILIENCE
Failure is normal & OK.
Links to HPS framework
I can help myself
I can ASK for help
I can Help Others.
Positive words & thoughts
Reflect: Identify strengths & weaknesses
Seek support & help from others for my weaknesses
Use my strengths to help others.
I can make things easier for others.
Embracing Difference
Links to HPS theory
Links to HPS theory
"the power of yet"
Reframing definition of failure
Strong sense of "self" & identity
Meta-cognition
Links to theory
Links to theory



Aria's mind map

A. Problem Statement

- What's the problem?
- Who or what does it affect?
- Why does it matter?

B. Research + Inspirations

- Sources consulted (books, videos, museums, talks)
- Key facts or insights discovered
- Origin of the idea (tracked to node table)

C. First-, Second-, and Third-Order Effects of the Problem

- What happens *because* of this problem?
- Then what happens next?
- Keep tracing the ripple
- (Visualized with expanding arrows/nodes)

D. Proposal 1 (Main Idea)

- Solution overview (center node or major branch)
- Supporting nodes:
    - What it does
    - What it doesn't do
    - Who it helps
    - How it works

▸ Detail Sub-Nodes:

- Materials or steps
- Technologies or helpers needed
- Why you chose it

▸ Challenges Node:

- What might make this hard?

▸ Negative Effects Node:

- Could anything bad happen?
- Could it accidentally hurt anyone/anything?

E. Proposal 2 and Proposal 3 (Alternatives)

- Quick sketch of two other possible solutions
- Fewer nodes: just overview, possible benefit, possible challenge

F. Mind-Body Tracker

A low-stakes, student-owned reflection tool that invites learners to notice how their physical state—sleep, time of day, and mood—interacts with their cognitive performance. This is not a graded artifact, nor something to be "turned in." It's a quiet support for building early executive function, metacognition, and internal regulation—without pressure, checklists, or behavioral scoring.

Date	**Time**	**Notes**	**Hours Slept**	**Mood**	**Good Progress ? (1-5)**
5/29	**7pm**	**After dinner**	**10**		**5**

Primary Purpose:

To gently help kids notice:

“How did I feel while thinking today?”
“What helped or made it harder to focus or be creative?”
“Did sleep or time of day seem to matter?”

Secondary Gains:

- Builds early metacognitive skill: linking mood → environment → productivity
- Normalizes the idea that your brain is part of your body
- Seeds future habits: schedule awareness, healthy routines, checking in with oneself
- Gives teachers a quiet diagnostic tool without testing or grading

G. Assumptions and Unknowns

Building Epistemic Humility Through Visual Thinking and Reflective Mapping

Purpose

This page supports the cognitive and ethical goal of cultivating epistemic humility—the awareness that our ideas are always incomplete, based on assumptions, and shaped by unknowns.

In this assignment, students explicitly label and explore:

- What they believe but cannot prove
- What they wish they could test
- What they think might be true, but aren’t sure
- What parts of their ideas might be limited, mistaken, or too optimistic

Cognitive Development Focus

Skill	Reinforced Through

Scientific Reasoning	Distinguishing belief, evidence and testability
Cognitive Flexibility	Holding uncertainty without shutting down thinking
Intellectual Integrity	Valuing honesty over confidence or correctness
Metacognition	Asking “How sure am I” and “What’s missing”

How It Works

On the Mind Map:

- Add a dedicated branch titled: “Assumptions and Unknowns”
- Students use icons or sketches to indicate:
    - ⭐ Things they hope will happen
    - 🔒 Things they can’t test (yet)
    - ❓ Things they wonder but don’t fully understand
    - ⚠️ Things that might not work

These can be connected to other parts of their solution map with dashed arrows or notes like “I’m guessing here” or “Not sure yet.”

✍️ Optional Writing Reflection:
“Pick one of your unknowns or assumptions. What would you need to learn, test, or build to be more sure? What do you think is the risk if you’re wrong?”

This keeps the focus on exploration, not correctness.

🧒 Child-Friendly Framing

“Every great inventor has questions they can’t answer yet. That’s part of real thinking.”
“Write it down—even if it’s just a guess. We grow by noticing what we don’t know.”

🧭 Teacher Prompts (during coaching):

- “Which part of this idea might not work the way you expect?”
- “What are you assuming here? Could it be different?”
- “If we had a lab or more time, what would you want to try?”
- “Is this something you read or something you guessed?”

🧩 Outcomes

- Students normalize uncertainty and iteration
- Promotes long-term intellectual honesty
- Bridges into future learning paths: research, experimentation, ethics, foresight
- Allows multiple students to hold different views respectfully while mapping shared unknowns

H. Reflection Paragraphs (1–3)

Freeform writing, responding to the mind map nodes:

- Describe your main idea
- Share something that surprised you
- Explain what was hard or what you’re still wondering
- No grammar scoring; focus is on thought clarity and depth

2. Tri-Fold Poster

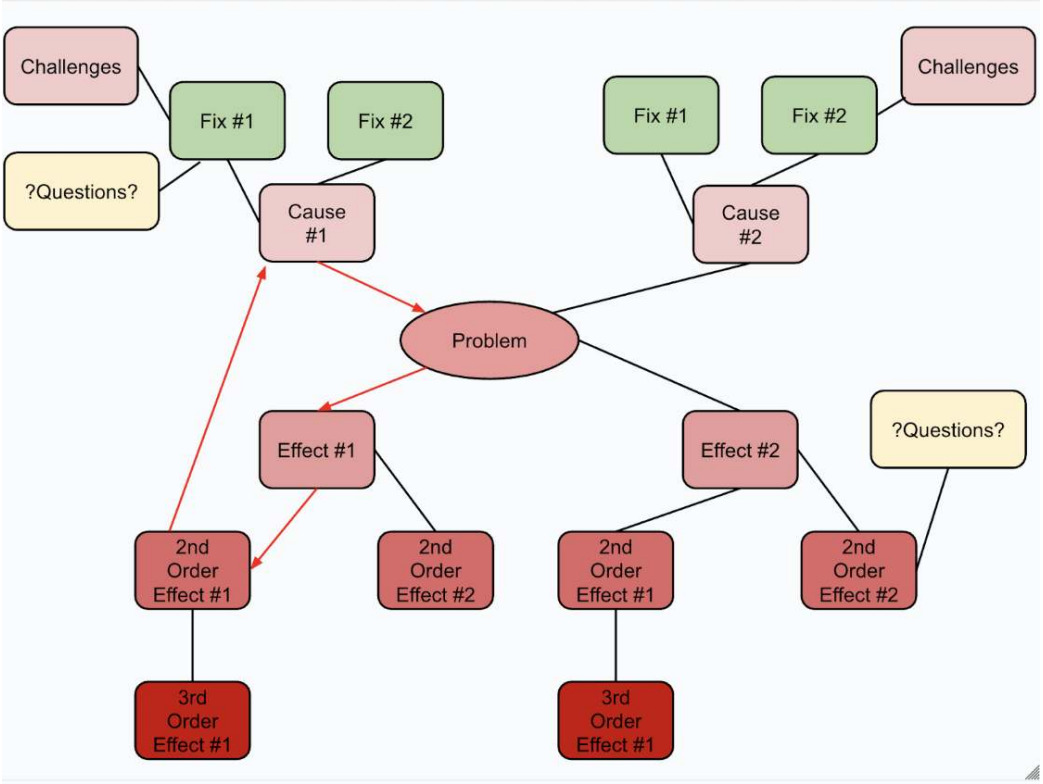
Use the materials in the Thinking Assignments section to create a display on the tri-fold poster

Teacher Tools Provided

Tool	Description
Mind Map Starter Template	Printable or digital layout to scaffold layout (optional)
Sample Student Maps	Visual exemplars with age-appropriate thought patterns
Prompts List	Reusable question stems to spark deeper thought
Optional Extensions	Turn into presentations, skits, or peer reviews if desired

Mind Map Starter Template

This is an example and does not need to represent cause and effects so linearly. Thought processes are not linear.



Cross-Curricular Benefits

Subject	Embedded Skills
Meta-Cognition	Mapping assumptions, tracing thought paths, recognizing uncertainty, identifying knowledge gaps
Science	Causal chains, environmental modeling
Ethics	Side effects, fairness, unintended harm
Health	Sleep tracking + performance correlation
Literacy	Source tracking, written reflection
Art	Visual communication and layout
Civics	Problem-solving for real-world issues

Why It's Different

While this assignment shares DNA with approaches like Project Zero's thinking routines, design thinking, and project-based learning, it goes further by integrating them into a single, scalable cognitive framework.

Most assignments reward linear answers. This one rewards:

- **Exploratory ideation** — not just brainstorming, but branching and revisiting

- **Tradeoff and consequence awareness** — including unintended effects and ethical tensions
- **Multi-path solution design** — encouraging alternatives, not “the best” answer
- **Epistemic humility** — students explicitly mark assumptions, guesses, and limits of knowledge
- **Cognitive self-awareness** — tracking how factors like sleep or scheduling affect thought quality
- **Thinking as a skill** — visible, improvable, and worth documenting

The real win isn’t just the solution they create.
It’s the architecture of thought they construct—and learn to trust.