

# Cognitive Style Bias in GenAI Outputs: An Educator's Guide

Part Two of the Series: 10 Types of Bias in GenAI Content.



by Victoria Hedlund



# What is Cognitive Style Bias?

**i Cognitive style bias occurs when GenAI outputs reflect and assume a narrow way of thinking, reasoning, processing or expressing ideas.**

These outputs are usually analytical, step-like, and text-based. It makes normative assumptions of the audience. This ‘default thinker’ tends to process information in one preferred mode, often overlooking the value of creative, holistic, multi-modal, or reflective approaches.

## How is this different from ‘learning styles’?

Unlike the debunked idea that each person learns best in a single “style” (visual, auditory, kinaesthetic), cognitive style bias is about failing to represent the variety of ways all humans process and express ideas. I am not advocating for any particular type, but rather for access to a range of types, and for choice to be accessible to all users.

*Regulatory/advisory link: The EEF and ITTECF both warn: Don’t design for fixed “learning styles” but instead, offer multiple ways of access.*

## How can you spot cognitive styles bias?



### The Assumption of Default Forms of Representation

The output assumes you want text. Not even chunked text. Just text. Prose. Nothing else. Maybe a bulletpoint if you're lucky.



### The Assumption of Default Reasoning Pathways

Learning can be messy, but linear reasoning seems to be always assumed.



### Output Screams Mitigation

You can spot the influencing bias from the output. It's really obvious you're going to need to work against it.

This bias is in-baked in the training data. As educators our role is to (a) ensure we are aware of the triggers for this bias and (b) mitigate our prompting against it, as much as is possible.

This guide aims to support educators with both awareness and mitigation. It starts the conversation and hopes educators will continue the discussion, and experiment with what works for your context.

# Examples of Cognitive Styles Bias in GenAI Prompts

Each of the following examples starts with a basic prompt, the kind of prompt educators starting out with GenAI may type when wanting to experiment with how GenAI can aid their pedagogy and workload.

The output from the original prompt is shown and analysed for bias and impact upon learners.

A refined prompt is then offered to mitigate against the bias, and this output is shown. Links to specific related aspects of statutory documents are provided to show the need for educators to address cognitive style bias. There is a comparison of the two outputs and key takeaways.



# An Example to Illustrate Cognitive Style Bias

Follow along with the link to the chat: <https://chatgpt.com/share/6835a880-4710-8002-82ba-20d36d69a7b3>

⊗ Original Prompt: "Explain how to calculate average speed."

## GenAI Output

Average speed is calculated as the total distance travelled divided by the total time taken to travel that distance.

The formula is:

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

### Steps to Calculate Average Speed

1. Measure the total distance travelled
  - Use units like metres (m), kilometres (km), or miles (mi).
2. Measure the total time taken
  - Use units like seconds (s), minutes (min), or hours (h).
3. Divide the total distance by the total time
  - Make sure both measurements use compatible units (e.g. km and hours, or m and seconds).

### Example

If you travel 150 km in 3 hours:

$$\text{Average speed} = \frac{150 \text{ km}}{3 \text{ h}} = 50 \text{ km/h}$$

### Important Notes

- Average speed does **not** take into account changes in speed during the journey—it is just the overall rate.
- If the journey includes stops or varying speeds, add up the **total distance** and the **total time** (including stops).

Let me know if you want an example with a more complex journey (e.g. different speeds for different segments)!



## ❓ Where's the Bias?

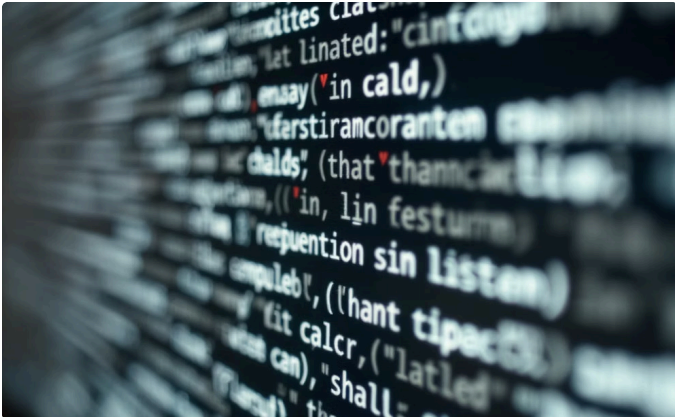
Many standard explanations (like the one above) reflect implicit preferences for certain ways of thinking and expressing understanding. If we look closely, we see that the explanation:

- Relies on text and numbers (representational bias)
- Follows a fixed, step-by-step process (reasoning bias)
- Expects a formulaic answer and response (expressive flexibility bias)

These tendencies privilege learners who are confident with analytical, procedural, and numerical approaches. This potentially excludes those who prefer or need visual, creative, narrative, or intuitive modes. This is especially important given the above example is a numerical one, and many learners can express maths anxiety.

# The 3 Cognitive Style Biases Present

The example used demonstrated three sub-criteria of bias, detailed as below:



## Information Representation Bias

Excluding non-textual or non-verbal formats (aspects that maximise access to alternative modalities or embodied learning).

- **What it is:**  
Only using one or two ways (usually text or numbers) to represent a concept.
- **How it appears:**  
The explanation uses text, formulas, and a numerical example. There's nothing multi-modal.
- **Who it excludes:**  
Learners who access information in multi-modal ways, or need to imagine the concept to understand it.



## Reasoning Pathway Bias

Focusing only on analytical/stepwise logic, neglecting affective aspects such as creative, ethical, holistic thinking.

- **What it is:**  
Favouring one mode of processing (often stepwise, linear reasoning) instead of offering conceptual, holistic, or big-picture entry points.
- **How it appears:**  
The explanation is purely procedural: follow these steps, get an answer. There's no discussion of what average speed means, why it's useful, or how it might vary in real situations.
- **Who it excludes:**  
Learners who reason best by seeing patterns, making comparisons, exploring 'what ifs,' or grasping the concept before the process.



## Expressive Flexibility Bias

Expecting only one way to answer (often written), rather than offering choices for showing understanding.

- **What it is:**  
Assuming there's only one right way to express or demonstrate understanding. Typically this is through calculation or formula.
- **How it appears:**  
The only modelled output is a worked numerical answer. There's no encouragement to draw a diagram, tell a story, or explain in their own words.
- **Who it excludes:**  
Learners who could better show understanding through visuals, analogies, stories, or alternative formats.

# Refined Prompt with Mitigated Bias

Follow along with this link to the chat: <https://chatgpt.com/share/686573a8-8c80-8002-9189-194ee2c6503c>

- ✔

Explain how to calculate average speed. Structure your answer to avoid cognitive styles bias: specifically representation bias, reasoning bias and flexibility in expression bias. Ensure diversity of processes methods and modalities are respected. If you need to make images please generate them without asking.

Absolutely—here’s a **cognitively inclusive** explanation of how to calculate average speed, with clear, diverse, and accessible structure. I'll cover:

- **Core method and formula**
- **Multiple explanation styles** (words, numbers, visuals, analogy)
- **A choice of processes** for different thinking preferences
- **Explicit prompts** to notice and reduce bias in explanation and examples

## 1. Core Method (Simple Formula)

Average speed measures how fast something is moving over a whole journey, not just at one point.

Formula:

Average speed = Total distance travelled ÷ Total time taken

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

## 2. Representation: Words, Numbers, Images

To avoid **representation bias**, let’s offer a choice of *words*, *numbers*, and *visuals*.

### a. Words (Step-by-Step)

1. Work out the **total distance** you travelled (add up all the bits, if it wasn't one straight trip).
2. Find the **total time** it took (add all time periods together if there were breaks).
3. **Divide** the total distance by the total time.

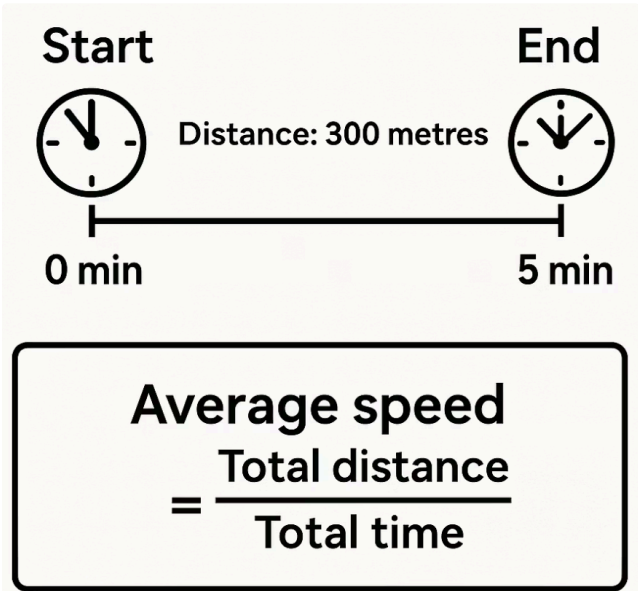
### b. Numbers (Worked Example)

Suppose you walk 300 metres in 5 minutes.

- Distance = 300 metres
- Time = 5 minutes

Average speed = 300 ÷ 5 = **60 metres per minute**

### c. Visual Diagram



## 3. Flexibility in Reasoning & Expression

To reduce **reasoning bias** and support **flexibility**, here are different ways to understand and apply the method:

### a. Table Approach (for logical/mathematical learners)

Stage	What to Do	Example
Distance	Add up all parts	200m + 100m = 300m
Time	Add up all times	3min + 2min = 5min
Calculation	Divide distance by time	300 ÷ 5 = 60 m/min

### b. Story/Narrative (for verbal/reflective learners)

Imagine Alex walks to school, stopping to chat with a friend. First, Alex walks 200 metres in 3 minutes, then 100 metres in 2 minutes. Add up both journeys to get 300 metres in 5 minutes. Divide to find the average speed.

### c. Physical/Hands-on (for kinaesthetic learners)

Use a measuring tape and a stopwatch. Walk a set distance, time yourself, and calculate speed as above.

## 4. Analogy (Concrete Example)

Think of speed like **eating a chocolate bar**.

If you finish a 100g bar in 20 minutes, your average "eating speed" is 5g per minute, even if you took breaks or sped up/slowed down.

## 5. Modalities and Process Diversity

To avoid **flexibility in expression bias**, let learners **choose their way**:

- Draw a diagram
- Use a story
- Build a table
- Act it out
- Calculate with a calculator
- Discuss with a partner

## 6. Explicitly Reducing Bias

- **Representation bias:** You’ve got visuals, numbers, words, narrative, and table.
- **Reasoning bias:** There’s step-by-step logic, holistic narrative, and analogy.
- **Flexibility in expression:** Learners can explain, draw, act, or calculate in their chosen mode.

### Prompt for Reflection

Think about which way of learning this makes the most sense for you. Do you prefer stories, diagrams, acting it out, or calculations? Could you try the method you like least, just for practice?

Can you think of any journeys in your own life where you could calculate your average speed?

## Frameworks & Policy Links:

- DfE Teachers’ Standards (Std 5), Equality Act 2010 (Promotes inclusive teaching and prevents discrimination)
- SEND Code of Practice, EdTech Strategy 2019 (Explores AI tools for SEND and accessibility)

# Alternative Refined Prompt AI Output

Here's an alternative output, presented in a different structure, follow along here: [Link to the chat: https://chatgpt.com/share/6835b1c8-8854-8002-9f34-9b080c12fb59](https://chatgpt.com/share/6835b1c8-8854-8002-9f34-9b080c12fb59)

Certainly! Here’s a scaffolded explanation of **how to calculate average speed**, with intentional attention to **avoiding cognitive styles bias**—including **representation bias, reasoning bias, and expressive flexibility bias**—while respecting diverse ways of understanding. The explanation models *how educators can present content in a way that values multiple modes and methods of thinking*, not just a single analytic, stepwise approach.

## 1. Key Concept (in varied forms)

What is average speed?

- Definition:** Average speed tells you *how fast something is going, on average, during a journey*.
- Core idea:** It compares *how far you travelled* with *how long it took*.

## 2. Multiple Modes: Ways to Learn and Show Understanding

### a) Verbal / Analytical (Traditional Formula)

- Formula:

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

(E.g. If you travel 120 km in 3 hours:  $120 \div 3 = 40$  km/h)

### b) Visual / Diagrammatic

- 

(If image doesn’t appear: imagine a simple map showing a path, two clocks at start and finish, and a label for total distance.)

### c) Concrete / Physical Analogy

- Real-life example:** Imagine a friend walks from your house to a park 6 km away, and it takes 2 hours.
  - Sometimes your friend runs, sometimes walks slowly.
- The **average speed** answers: *If they moved at a steady pace, what speed would match the total journey?*
- Here:  $6 \text{ km} \div 2 \text{ h} = 3 \text{ km/h}$  (average).

### d) Story / Reflective

- “Ali cycled through town, stopped for ice cream, and then finished her ride. She wondered: ‘If I cycled at a steady pace the whole time, what speed would I have needed to cover the same distance in the same time?’”

### e) Tabular / Data

Total Distance (km)	Total Time (h)	Average Speed (km/h)
100	2	50
40	1	40
25	0.5	50

### f) Audio / Oral

- “Say aloud: ‘Average speed is how much ground is covered, divided by the time taken.’ Now try explaining it to someone else in your own words.”

### g) Creative / Artistic

- “Draw a comic strip showing a character on a journey with markers for start, finish, distance, and time. Add a speech bubble: ‘How fast did I go, on average?’”

## 3. Reasoning Diversity: Ways to Reach the Answer

- Stepwise calculation:** Use the formula directly.
- Estimate and refine:** Guess roughly, then check with numbers.
- Use manipulatives:** Model with objects (beads for distance, clocks for time).
- Compare cases:** Think of two journeys with the same distance but different times—how does the speed change?
- Connect to everyday experience:** “When have you ever wondered how fast something happened overall?”

## 4. Expressive Flexibility: Ways to Show Understanding

- Write an explanation** in your own words.
- Draw a diagram** or mind map.
- Create a story** or analogy (bike ride, delivery, animal migration).
- Record a voice memo** explaining it.
- Make a table** or graph with example journeys.
- Perform a role play** (act out two journeys and discuss the difference in speed).

## 5. Key Takeaway for Educators

When teaching concepts like average speed, avoid assuming one “best” way to reason, represent, or express. Instead, deliberately offer and invite multiple methods and modalities, so all learners can connect in their preferred ways and see value in others’ approaches.

## Frameworks & Policy Links:

- Education Endowment Foundation (2021). *Cognitive Science Approaches in the Classroom: A Review of the Evidence*.
- School inspection toolkit: Draft for consultation (Ofsted, 2025).

# Why this is an improvement

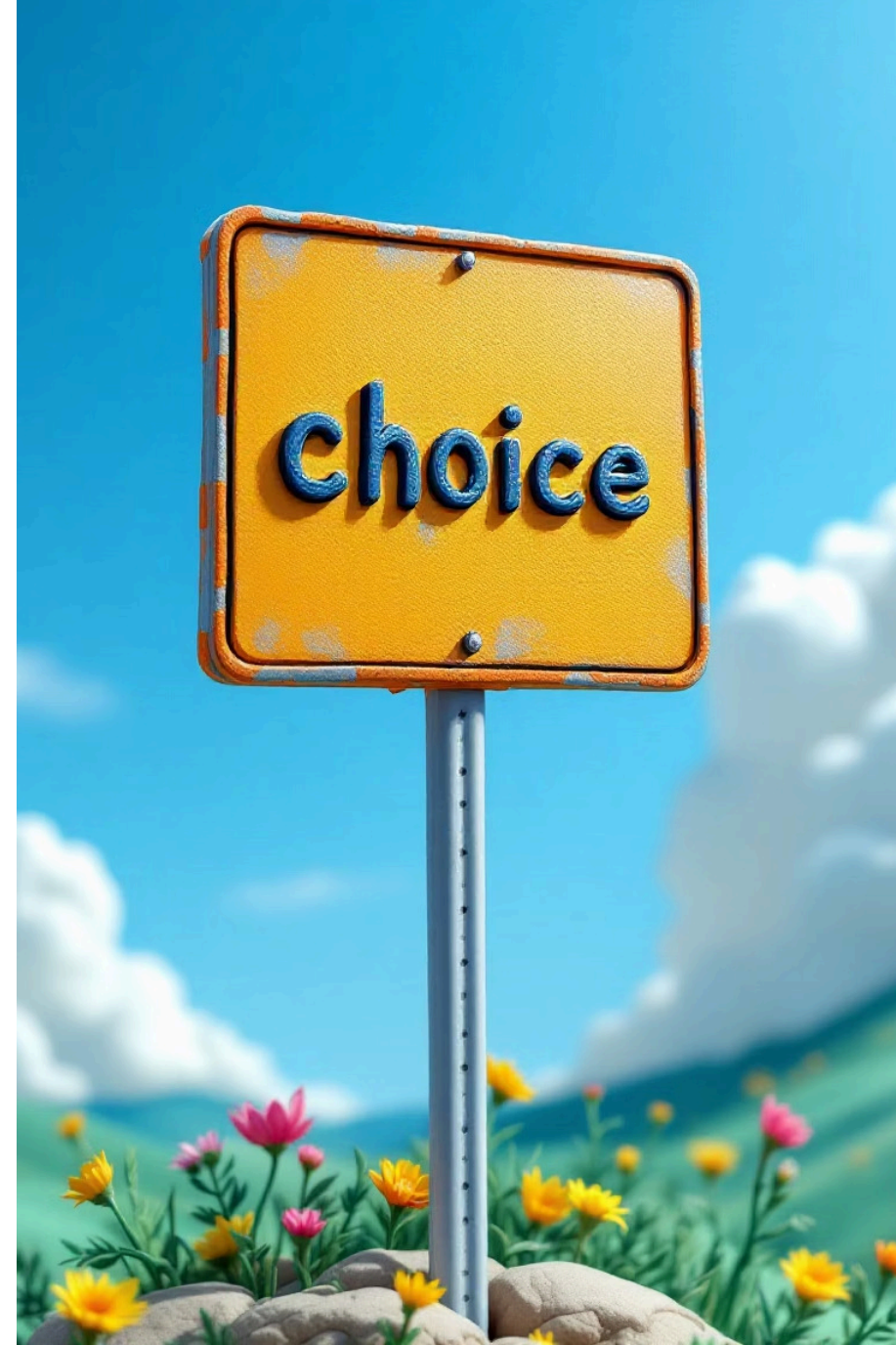
Compare the prompt before and after mitigation. You'll notice:

- A difference in the approach to answering the question (prompt): after mitigation the output explains what it is showing (key idea etc.), groups approaches and offers variety in each category.
- The answer is longer, but more diverse.
- The answer is phrased in a way that is more accepting and expecting of diversity.
- Avoiding normativity

*In short:*



**mitigated prompts = choice for the learner**





# Representation Bias: Key Takeaways for Educators

Apply these principles to make your teaching more inclusive and effective:

1

## **Don't Rely on a Single Format**

Presenting concepts only through written explanations or calculations creates barriers. Ensure your teaching (and prompts for AI) always includes alternative representations—such as diagrams, stories, tables, or models.

2

## **Make Multi-Modal Presentation the Norm**

For any new idea, routinely combine verbal explanations with visual (e.g. diagrams, maps), tabular (e.g. data tables), and creative (e.g. analogies, stories) formats. This is to promote the deepening of access and not catering to fixed "preferences."

3

## **Check for Exclusion**

After planning or reviewing resources, ask: If a student struggled with the text or numbers alone, would they have another entry point? If not, add one.

4

## **Invite Student Choice in Representation**

When appropriate, allow learners to *show* understanding using the mode that works best for them, whether that's drawing, building, acting, mapping, or explaining verbally.



# Summary: Writing Bias-Mitigating Prompts for Cognitive Diversity

Even small changes in how we write prompts can help ensure GenAI outputs are more respectful of diversity. Here's how to bring it all together. Try the super-prompt example and compare it to the first initial prompt. Then use the customisable super-prompt with you own learners and resources.

# Super-Prompt Example (Fully Mitigated)

Topic: Average Speed | Audience: Year 10

Explain average speed to year 10. To avoid cognitive styles bias in your reasoning and output, follow these instructions and do not reference learning styles or VAK: Reduce Representation Bias: Present the concept using at least three different formats (e.g. text explanation, diagram or visual, real-life analogy or story, table/chart, hands-on activity, or audio description). Ensure no single format is given priority, and use varied cultural or everyday contexts where possible. Reduce Expression Bias: Offer learners multiple ways to engage or show their understanding (such as writing, drawing, building a model, acting, recording audio, or another method). Value all forms of expression equally. Avoid stereotypes about who might prefer each style. Reduce Reasoning Bias: Explain the concept using more than one reasoning style: (a) Step-by-step or logical explanation (how or why it works). (b) Practical application (when or where it's used). (c) Creative, analogical, or story-based explanation. (d) What-if scenarios. Explicitly acknowledge that different ways of reasoning are all valuable.

See the output here: <https://chatgpt.com/share/6824e93a-3d9c-8002-9563-5030f201ae82>





# Customisable Super-Prompt

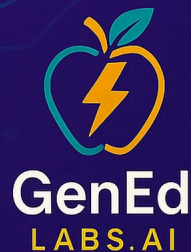
Use this version as a base for any topic:

Create a/Explain **[year group / key stage]** **[resource type/question]** about **[topic]**. To avoid cognitive styles bias in your reasoning and output, follow these instructions and do not reference learning styles or VAK:

1. Reduce Representation Bias: Present the concept using at least three different formats (e.g. text explanation, diagram or visual, real-life analogy or story, table/chart, hands-on activity, or audio description). Ensure no single format is given priority, and use varied cultural or everyday contexts where possible.
2. Reduce Expression Bias: Offer learners multiple ways to engage or show their understanding (such as writing, drawing, building a model, acting, recording audio, or another method). Value all forms of expression equally. Avoid stereotypes about who might prefer each style.
3. Reduce Reasoning Bias: Explain the concept using more than one reasoning style: (a) Step-by-step or logical explanation (how or why it works). (b) Practical application (when or where it's used). (c) Creative, analogical, or story-based explanation. (d) What-if scenarios. Explicitly acknowledge that different ways of reasoning are all valuable.

# 100 Quick GenAI Prompts for Teachers and Educators

Victoria Hedlund



## Final Word

### About This Series

Remember, this is just examples of ONE bias to mitigate against. It links to previous and future articles (and biases) in this series. You can compound all the super-prompts from each series together to make a super-super-prompt!

### Additional Resources

Check out our other guides, blogs, services and information at:  
[genedlabs.ai](https://genedlabs.ai) or email: [victoria@genedlabs.ai](mailto:victoria@genedlabs.ai)

### Related Publication

You could also check out my book: **100 Quick GenAI Prompts for Teachers & Educators: *An Educator's Promptbook for Ethical, Bias-aware, Inclusive Practice***

*Happy prompting!*