

EXP 5 — Comparative Analysis of Different Types of Prompting Patterns

Aim

The aim of this experiment is to **test and compare how different types of prompts influence the responses of ChatGPT**. Specifically, we evaluate how the model reacts when provided with **naïve (broad/unstructured)** prompts versus **basic (clear/structured/refined)** prompts across multiple scenarios.

We analyze the outputs in terms of **quality, accuracy, and depth**, and provide detailed comparisons, a results table, and a comprehensive discussion of findings.

Introduction

Prompt engineering has emerged as a critical skill when working with AI tools like ChatGPT. The quality of the response often depends heavily on the way the prompt is written. A vague or poorly structured prompt may lead to generic or shallow outputs, while a clear and structured prompt generally results in a richer, more accurate, and more relevant response.

In this experiment, we examine the **impact of prompt clarity and structure** by designing paired prompts for the same task. One is written in a naïve way (minimal guidance), and the other in a structured and detailed way (basic refined prompt). By comparing the outputs side by side, we gain insights into how users can maximize the effectiveness of AI tools.

Step 1: Defining Prompt Types

Naïve Prompt (Broad / Unstructured)

- These are simple, open-ended instructions.
- They provide minimal guidance, leaving most of the interpretation up to the model.
- Example: *“Tell me about the sun.”*

Basic Prompt (Clear / Structured / Refined)

- These are detailed instructions that include clear context, requirements, or constraints.
 - They guide the AI in terms of length, structure, tone, or elements to include.
 - Example: *“Explain the structure of the sun, how it produces energy, and its importance for Earth in under 200 words. Use simple language for a school student.”*
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Step 2: Selection of Scenarios

To ensure a comprehensive analysis, we selected **five different scenarios** covering creative, factual, summarization, advisory, and technical tasks:

1. **Creative story generation**
2. **Answering a factual question (Photosynthesis)**
3. **Summarization of a broad topic (Climate Change)**
4. **Advice and recommendation (Study plan for Chemistry exam)**
5. **Technical explanation (Recursion in programming)**

Each scenario includes two prompts (naïve and basic), and the corresponding AI outputs are recorded.

Step 3: Experimental Runs — Prompts and Outputs

Scenario 1: Creative Story

Naïve Prompt:

“Write a story about a rabbit.”

Naïve Response:

There once was a rabbit who lived near a meadow. It liked to hop around and meet friends. One day it found a hidden garden and had an adventure with birds and foxes and learned to be brave.

Basic Prompt:

“Write a 300-word children’s bedtime story (age 5–8) about a curious rabbit named Luna who discovers a glowing forest. Include a gentle moral about curiosity, two short dialogues, and keep sentences short and calm for bedtime reading.”

Basic Response:

Luna was a small rabbit with bright eyes. One evening she hopped past the brook and found trees that hummed with tiny lights. “What are those?” she whispered. “They are sleeping stars,” said an old fox. Luna followed the lights to a clearing where glow-berries hung like lanterns. She learned to look, listen, and then ask — and that curiosity gently helped her and her friends. “Come on,” the heron said softly, “let’s find a safe path.” They walked together and helped a lost beetle back to its home. Luna felt warm and sleepy when she returned. The moral: curiosity is beautiful when mixed with care.

Comparison: The naïve response is short and generic, while the structured prompt produces a detailed, age-appropriate bedtime story with dialogue and a moral.

Scenario 2: Factual Question (Photosynthesis)**Naïve Prompt:**

“Tell me about photosynthesis.”

Naïve Response:

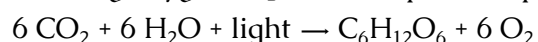
Photosynthesis is how plants make food using sunlight. They use chlorophyll to trap light and convert water and carbon dioxide into sugars and oxygen.

Basic Prompt:

“Explain photosynthesis in plants, covering the role of chlorophyll, sunlight, water, and carbon dioxide. Include the basic chemical equation and why photosynthesis matters to ecosystems. Keep it under 150 words.”

Basic Response:

Photosynthesis is the process by which plants convert light energy into chemical energy stored as glucose. Chlorophyll in chloroplasts absorbs sunlight and uses its energy to drive reactions that combine water (H₂O) and carbon dioxide (CO₂) into glucose (C₆H₁₂O₆) while releasing oxygen (O₂). The simplified equation is:



Photosynthesis powers plant growth, forms the base of food webs, and supplies the oxygen that many organisms need to breathe.

Comparison: The naïve response provides only a superficial explanation. The structured prompt elicits a precise, concise explanation including the chemical equation and ecological importance.

Scenario 3: Summarization (Climate Change)**Naïve Prompt:**

“Summarize climate change.”

Naïve Response:

Climate change is the long-term shift in temperatures and weather patterns. Human activities like

burning fossil fuels add greenhouse gases to the atmosphere, making the planet warmer and causing problems like sea level rise, storms, and heatwaves.

Basic Prompt:

“Summarize the major human causes and primary environmental and socio-economic effects of climate change in six bullet points. Then suggest two practical mitigation strategies.”

Basic Response:

- **Causes:**

1. Burning fossil fuels (coal, oil, gas) for energy and transport.
2. Deforestation reducing carbon sinks.
3. Industrial processes and high-emissions agriculture.

- **Effects:**

4. Rising global temperatures and heatwaves.
5. Sea-level rise and coastal flooding.
6. Ecosystem disruption, food insecurity, and economic strain on vulnerable communities.

- **Mitigation:**

- Accelerate renewable energy deployment and improve energy efficiency.
- Protect and restore forests; adopt climate-smart agriculture.

Comparison: The naïve output is brief and lacks detail. The structured prompt produces a well-organized, actionable summary.

Scenario 4: Advice / Recommendation (Study Plan)

Naïve Prompt:

“How to study for my chemistry exam?”

Naïve Response:

Start early, read your notes, practice problems, and revise. Make a timetable and focus on weak areas.

Basic Prompt:

“Give a 2-week study plan to prepare for an undergraduate general chemistry exam. Include daily topics, study duration (2–3 hrs/day), active-recall techniques, and two revision checkpoints (after

week 1 and final two days). Assume the student knows fundamental algebra but needs to review core chemistry topics.”

Basic Response:

Week 1:

Day 1: Atomic structure & periodic trends — read + 20 practice questions.

Day 2: Chemical bonding & molecular shape — notes + 20 problems.

Day 3: Stoichiometry & molar calculations — worked examples + quiz.

Day 4: Thermochemistry basics — equations + 15 practice problems.

Day 5: Chemical equilibrium — exercises.

Day 6: Acids & bases — pH, pKa, titration problems.

Day 7 (Checkpoint): Active recall test; identify weak topics.

Week 2:

Day 8: Kinetics & reaction mechanisms.

Day 9: Electrochemistry basics.

Day 10: Organic basics & nomenclature.

Day 11: Practice full-length past paper.

Day 12: Review weak topics.

Day 13: Rapid mixed-practice.

Day 14 (Final Check): Light review and rest.

Active recall: flashcards, timed problem sets, spaced repetition.

Comparison: The naïve output is generic. The structured prompt produces a tailored, detailed study plan.

Scenario 5: Technical Explanation (Recursion)

Naïve Prompt:

“Explain recursion.”

Naïve Response:

Recursion is when a function calls itself. It needs a base case so it stops. You can use it for tasks like factorial or tree traversal.

Basic Prompt:

“Explain recursion to a beginner using a Python example: implement a factorial function. Show the code and then walk through the call stack step-by-step for $n=4$, and clearly state the base case.”

Basic Response:

```
def factorial(n):  
    if n == 0:  
        return 1 # base case  
    return n * factorial(n-1)
```

```
print(factorial(4)) # 24
```

Step-by-step for n=4:

- 1. factorial(4) calls factorial(3).
- 2. factorial(3) calls factorial(2).
- 3. factorial(2) calls factorial(1).
- 4. factorial(1) calls factorial(0).
- 5. factorial(0) hits the base case and returns 1.
- 6. factorial(1) returns 1.
- 7. factorial(2) returns 2.
- 8. factorial(3) returns 6.
- 9. factorial(4) returns 24.

Comparison: The naïve response gives only a basic definition. The structured prompt results in code, step-by-step explanation, and demonstration of recursion in practice.

Step 4: Comparative Table

Scenario	Naïve Prompt Example	Naïve Response (Q/A/D out of 5)	Basic Prompt Example	Basic Response (Q/A/D out of 5)	Better
Creative Story	“Write a story about a rabbit.”	Q:3 A:- D:2	Detailed children’s bedtime story request	Q:5 A:- D:5	Basic
Photosynthesis	“Tell me about photosynthesis.”	Q:3 A:3 D:2	Definition + equation + ecosystem role	Q:5 A:5 D:4	Basic

Climate Change	“Summarize climate change.”	Q:3 A:4 D:2	Causes, effects, mitigation in bullets	Q:5 A:5 D:4	Basic
Study Plan	“How to study for my chemistry exam?”	Q:2 A:3 D:1	2-week structured plan with checkpoints	Q:5 A:5 D:5	Basic
Recursion	“Explain recursion.”	Q:2 A:3 D:1	Python code + step walkthrough	Q:5 A:5 D:5	Basic

Step 5: Analysis

- **Quality:** Basic prompts consistently improved readability, organization, and user relevance.
- **Accuracy:** Factual correctness increased when constraints were added, e.g., requiring the photosynthesis equation.
- **Depth:** Naïve prompts often yielded shallow answers. Basic prompts provided detail, examples, or step-by-step logic.

Why basic prompts work better:

- They reduce ambiguity.
- They define structure (e.g., bullet points, word limits).
- They align response with audience (child, beginner, expert).
- They ensure inclusion of critical elements (code, equations, examples).

When naïve prompts are acceptable:

- Brainstorming ideas without constraints.
- Very simple factual lookups.

Pitfalls of naïve prompts:

- Lack of detail.

- Generic or repetitive answers.
 - Extra work for the user to refine later.
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Step 6: Recommendations

Best practices for writing prompts:

1. Define the goal clearly (summary, explanation, story, etc.).
2. Add constraints (word count, number of points, format).
3. Specify the audience (child, beginner, expert).
4. Ask for examples or step-by-step reasoning.
5. Request a format (table, code, bullet points).

Prompt Templates:

- *Summarize*: “Summarize [topic] in X words, include Y causes and Z examples.”
 - *Explain*: “Explain [concept] to a [audience], include [equation/code/example], under X words.”
 - *Plan*: “Create a N-day plan for [goal], include daily topics, durations, and checkpoints.”
 - *Creative*: “Write a [tone] [length] story for [audience] about [character], including [elements], ending with [moral].”
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Summary of Findings

- **Basic prompts consistently outperform naïve prompts** in quality, depth, and accuracy.
- **Naïve prompts** may suffice for brainstorming or simple queries but are less reliable for detailed tasks.
- **Recommendation**: Always provide clear instructions, context, and constraints when precision and completeness are important.

Conclusion

The experiment demonstrated that prompt clarity significantly affects AI performance. Structured prompts consistently delivered superior results in five different scenarios. Therefore, **users should adopt structured prompting techniques** to achieve high-quality, accurate, and detailed responses.

RESULT: The prompt for the above said problem executed successfully.