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## Chapter 3 – Crafting Effective Prompts

### 3.1 Introduction to Writing Effective Prompts

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Type of activity	Page
Contents	<p>To get the most out of GenAI tools you must understand how to communicate with them. This communication is called '<b>prompting</b>'. In today's rapidly evolving technological landscape, mastering the art of prompting isn't just a 'nice-to-have' skill, but will be a 'necessary' skill for anyone planning a career in and outside of academia. Knowing how to ask the right questions can be a game-changer, therefore, we would like to spend a bit of time helping you understand the key principles of this skill.</p> <p>At the GSLS, we emphasise developing a value system of usage that ensures we remain in control of technology, regardless of its advancements. This approach aims to use AI tools to enhance cognitive skills and self-confidence while reducing overdependence on technology. By thoughtfully considering the specific outcomes we seek from these tools, we can determine their necessity and optimize their utility.</p> <p>Crafting detailed initial prompts is pivotal for obtaining high-quality outputs from GenAI. While these models can interpret vague inputs, precise and structured prompts yield more accurate and relevant responses. If the initial prompt lacks specificity, employing a scaffolding approach (asking targeted follow-up questions) can refine the output. However, this requires more energy usage. Well-structured prompts not only improve the quality of interactions but also enhances efficiency, reducing environmental impact. This approach aligns with the GSLS's commitment to responsible and innovative use of technology in advancing education and research.</p>

	<p><b>me after giving chatgpt the same prompt 20 different ways and it still doesn't understand</b></p>  <p><i>memes source: <a href="https://www.digitalmomblog.com/chatgpt-memes/">https://www.digitalmomblog.com/chatgpt-memes/</a></i></p>	
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3.2 BRAVE(R) for Learning Assistance

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Activity type	Page
Contents	<p>To guide you in crafting effective prompts, we recommend adhering to the BRAVE(R) Framework. This structured approach will enable you to obtain more precise and contextually relevant responses, thereby enhancing the utility of GenAI tools. The components of the BRAVE(R) framework—Boundaries, Role, Audience, Variables, Expectations, and Refine—do not need to be addressed in a specific order, nor do they imply a hierarchy of importance. Each component plays a crucial role in ensuring the clarity and relevance of the generated content. The BRAVE(R) Framework is designed to be flexible, allowing you to tailor your prompts based on the specific needs of your task. By considering each component thoughtfully, you can optimize the effectiveness of GenAI tools in various educational and research contexts.</p> <div><div><b>B: Boundaries</b><div>Set limits on the format, length, or any other constraints.</div></div><div><b>R: Role</b><div>Identify the role or perspective you want the AI tool to take.</div></div><div><b>A: Audience</b><div>Specify who the output is intended for to determine the appropriate tone and style.</div></div><div><b>V: Variables</b><div>Highlight key details, variables, or points that should be included in the response.</div></div><div><b>E: Expectations</b><div>Clearly state what you expect the AI to accomplish, including the intended outcome and purpose.</div></div><div><b>(R): Refine</b><div>Provide feedback to improve the output and guide future interactions.</div></div></div> <p><i>Prompt formulation by Christine Fox, in collaboration with ChatGPT (May 2024).</i></p>

**Example 1: Creating a Study Guide**

"Please review the introduction section of my life sciences research article. I want you to advise me but not rewrite the entire abstract (**E**). For this task, take on the role of a peer reviewer (**R**). The suggestions should be suitable for an academic audience, specifically for submission to a journal (**A**). Please can you advise me in making my introduction clear, concise, and impactful (**E**). The word limit is around 250 words (**B**). Highlight any issues with the argument structure, clarity, and relevance of the cited works, in addition to possible rewording to make it more concise (**V**).

Thank you, but can you please suggest another word for 'mystify'? I do not feel this word is appropriate for scientific academic publishing (Refine).

**Example 2: Creating a Study Guide**

"Please help me create an outline of the key concepts covered in my molecular biology course (**E**). For this task, take on the role of a course instructor (**R**). The suggestions should be suitable for a student preparing for a master's level exam (**A**). Focus on the most crucial points that are likely to be tested and present the information as bullet points (**B**). Highlight the main topics and their significance (**V**)."







*With this prompt it is important to include whatever material you have to help it tailor its response. You can do this by attaching and uploading a file or by copying and pasting and including at the end of your prompt.*

**Example 3: Brainstorming Research Ideas**

"Can you please help me brainstorm some innovative approaches or perspectives to explore within the field of regenerative medicine (**E**)? For this task, take on the perspective of a course instructor guiding research projects (**R**). The suggestions should be suitable for a graduate student looking to stand out in their research (**A**). Provide a list of ideas along with a brief explanation and potential challenges for each (**B**). Highlight unique and impactful angles to consider (**V**)."

For more prompting practice this is a helpful link: [AI For Students – More Quality in Less Time \(aivoorstudenten.nl\)](https://aivoorstudenten.nl)

3.3 BRAVE(R) for Image Creation

3.3 BRAVE(R) for Image Creation	
Activity type	Page
	<div><p>The BRAVE(R) framework is also effective for image generation tasks due to its flexibility in addressing key components like Variables, which specify important details such as elements to include and visual styles. This ensures the generated images are precise and contextually relevant, enhancing the utility of GenAI tools across diverse applications.</p><div><div><b>B: Boundaries</b><div>Set limits on the format, length, or any other constraints.</div></div><div><b>R: Role</b><div>Identify the role or perspective you want the AI tool to take.</div></div><div><b>A: Audience</b><div>Specify who the output is intended for to determine the appropriate tone and style.</div></div><div><b>V: Variables</b><div>Highlight key details, variables, or points that should be included in the response.</div></div><div><b>E: Expectations</b><div>Clearly state what you expect the AI to accomplish, including the intended outcome and purpose.</div></div><div><b>(R): Refine</b><div>Provide feedback to improve the output and guide future interactions.</div></div></div><p><i>Prompt formulation by Christine Fox, in collaboration with ChatGPT (May 2024).</i></p><p><b>Example prompts:</b> "Could you please assist me in conceptualising a 3D model of a specific protein structure (<b>E</b>)? For this task, take on the role of a visualisation expert (<b>R</b>). The model should include key amino acids and functional domains (<b>B</b>).</p></div>

The purpose is to help visualise complex biochemical interactions for my biochemistry course presentation for master students (**A**)"



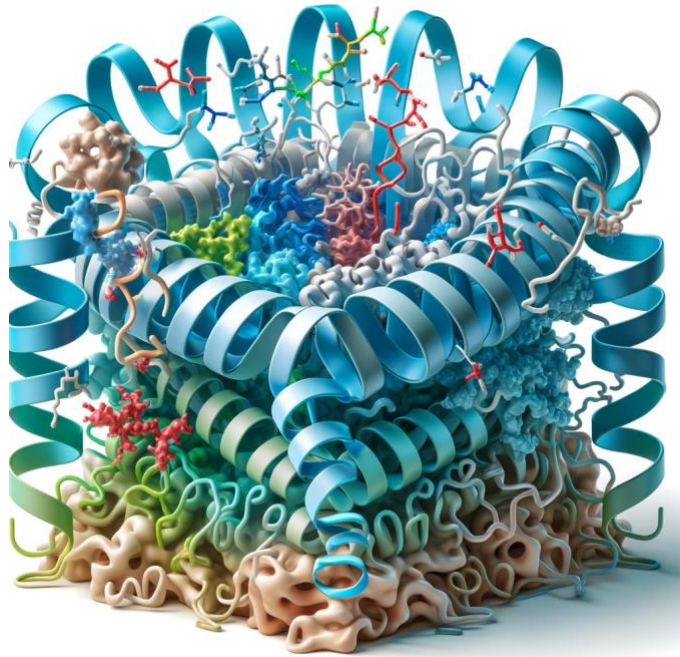
(DALL-E October 2023)

Adding a bit more detail to your prompt can greatly improve the quality of the image!

**New prompt:**

"I need a 3D model of a protein structure to help visualize its interactions, especially with ATP ligands and its dimerisation with Protein ZZZZ (**E**). The image will be used in a PowerPoint presentation for my Master level biochemistry course (**A**). For this task, take on the role of a visualisation expert (**R**). The model should highlight the key amino acids: Arginine at position 50, Lysine at position 75, and Tryptophan at position 100, and highlight the DNA-binding domain and the kinase domain as the primary functional domains (**V**). I think a ribbon diagram style would be best, with the DNA-binding domain in blue, kinase domain in red, and the highlighted amino acids in green (**B**).











(DALL-E April 2025)

After creating your image, you can *refine* it with additional prompts. Note that these adjustments may significantly alter the original image.

3.4 BRAVE(R) for Coding

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Activity type	Page
Contents	<p>The BRAVE(R) framework is also effective for coding tasks because of its flexibility in addressing key components like Variables, which specify important details such as inputs, functions, and steps. This ensures the generated code is precise and contextually relevant, enhancing the utility of GenAI tools across diverse educational and development applications. However, it's important to note that simpler coding tasks, such as solving errors or debugging, may not always require the full application of the BRAVE(R) framework. In these cases, more streamlined approaches can be used. For more on this, refer to section 3.6 Simple Tasks.</p> <div><div><b>B: Boundaries</b><div>Set limits on the format, length, or any other constraints.</div></div><div><b>R: Role</b><div>Identify the role or perspective you want the AI tool to take.</div></div><div><b>A: Audience</b><div>Specify who the output is intended for to determine the appropriate tone and style.</div></div><div><b>V: Variables</b><div>Highlight key details, variables, or points that should be included in the response.</div></div><div><b>E: Expectations</b><div>Clearly state what you expect the AI to accomplish, including the intended outcome and purpose.</div></div><div><b>(R): Refine</b><div>Provide feedback to improve the output and guide future interactions.</div></div></div> <p><i>Prompt formulation by Christine Fox, in collaboration with ChatGPT (May 2024).</i></p>



**Example 1: Generating a Scatter Plot**

"Please help tutor me in generating a scatter plot using Matplotlib in Python. I expect you to guide me through the process of creating a scatter plot using the provided data, which should include an explanation of why the plot might not display correctly (**E**). For this task, take on the role of a coding tutor (**R**). The code should be understandable for a biology student with basic knowledge of Python (**A**). Provide the code in a format that can be easily run in a Jupyter Notebook (**B**). The data is in a CSV file with 'x' and 'y' columns, and include comments in the code to explain each step (**V**).

(**Refine**) Please suggest additional resources for understanding matplotlib if necessary.

**Example 2: Normalizing RNA-seq Data**

"Please help me normalize RNA-seq data using the DESeq2 package in R. Guide me through the process and help me troubleshoot any potential errors or issues that arise (**E**)? For this task, take on the role of a bioinformatics instructor (**R**). The code should be suitable for a life sciences student with some experience in R (**A**). Provide the code in a format that can be easily run in an R environment (**B**). The data is from RNA-seq experiments, and include comments in the code to explain each step (**V**)."

(**Refine**) Please suggest additional resources for understanding DESeq2 if necessary."

**Example 3: Calculating a p-value in Python**

"Please help me calculate the p-value for two lists of floats in Python. I expect you to help me write the code to conduct a two-sample T-test and to help me address potential discrepancies in the P-value calculations (**E**). For this task, take on the role of a statistics tutor (**R**). The code should be suitable for a student with basic knowledge of Python and statistics (**A**). Provide the code in a format that can be easily run in a Python environment (**B**). The data consists of two lists of floats representing A/B test results, and include comments in the code to explain each step (**V**)."

(**Refine**) Please suggest additional resources for understanding statistical tests in Python if necessary.

#### Example 4: Explaining a Scatter Plot Code

"Please help me understand why my scatter plot code in Python is not displaying correctly. I expect to learn why it is not displaying correctly and how to fix it (**E**). For this task, take on the role of a coding tutor (**R**). The explanation should be suitable for a biology student with basic knowledge of Python (**A**). Provide a detailed explanation of each line of code, including any potential issues (**B**). Here is the code I'm using (**V**):

##### Python Code

```
python Copy code  
  
import matplotlib.pyplot as plt  
import pandas as pd  
  
data = pd.read_csv('data.csv')  
plt.scatter(data['x'], data['y'])  
plt.show()
```

Prompt Code generated by ChatGPT 4o, May 2024.

(**Refine**) Please suggest additional resources for understanding matplotlib if necessary."

#### Example 5: Explaining RNA-seq Data Normalization Code

"Please help me understand my R script for normalizing RNA-seq data using DESeq2. I expect to learn how this code normalizes RNA-seq data (**E**). For this task, take on the role of a bioinformatics instructor (**R**). The explanation should be suitable for a life sciences student with some experience in R (**A**). Provide a detailed explanation of each line of code, including any potential issues (**B**). Here is the code I'm using (**V**):

##### R Code

```
r Copy code  
  
library(DESeq2)  
  
# Assuming 'counts' is a matrix of raw counts  
dds <- DESeqDataSetFromMatrix(countData = counts, colData = colData, design = ~ c  
  
dds <- DESeq(dds)  
  
normalized_counts <- counts(dds, normalized=TRUE)
```



Prompt Code generated by ChatGPT 4o, May 2024.

**(Refine)** Please suggest additional resources for understanding DESeq2 if necessary.

### Example 6: Explaining p-value Calculation Code

"Please help me understand my Python script for calculating the p-value for two lists of floats. I expect to learn how this code calculates the p-value **(E)**. For this task, take on the role of a statistics tutor **(R)**. The explanation should be suitable for a student with basic knowledge of Python and statistics **(A)**. Provide a detailed explanation of each line of code, including any potential issues **(B)**. Here is the code I'm using **(V)**:

#### Python Code

```
python Copy code  
  
from scipy import stats  
  
list_a = [1.1, 2.3, 3.3, 4.4, 5.5]  
list_b = [2.1, 3.4, 2.9, 4.8, 5.1]  
  
t_stat, p_value = stats.ttest_ind(list_a, list_b)  
  
print(p_value)
```

Prompt Code generated by ChatGPT 4o, May 2024.

**(Refine)** Please suggest additional resources for understanding statistical tests in Python if necessary."

For more information about Generative AI in computing education:

<https://www.uu.nl/en/research/generative-ai-for-computing-education>

<https://www.uu.nl/en/research/generative-ai-for-computing-education/teaching-practices>

<https://www.uu.nl/en/research/generative-ai-for-computing-education/teaching-materials>

### 3.5 Overloading Prompts and Factored Cognition

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Activity type	Page
Contents	<p>When crafting prompts for GenAI tools, it's important to avoid providing too much information at once. Overloading a prompt with extensive details can confuse the model, leading to inaccurate or irrelevant outputs. One way to avoid this is by breaking down tasks into smaller, manageable steps to improve the understanding and performance. This is known as <i>factored cognition</i>.</p> <p>Similarly, <i>chain-of-thought</i> (CoT) prompting encourages the AI to process information sequentially, enhancing its reasoning capabilities. By providing detailed, step-by-step instructions, you maintain control over the process, ensuring that the AI's output aligns closely with your expectations and the specific requirements of the task. This approach also ensures you don't complete the entire project using the GenAI tool and fosters collaboration.</p> <p><b>Prompting String Using the BRAVE(R) Framework with Factored Cognition</b></p> <p><u>Example Prompt:</u></p> <p>"ChatGPT, I need assistance with generating research ideas for a project in environmental biology. This task will consist of different parts. First, take on the role of a research advisor (<b>R</b>). The ideas should be appropriate for an academic audience, specifically for a graduate-level research proposal (<b>A</b>). Initially, I want you to identify five key current issues in environmental biology (<b>V</b>). The expected output is a list of these issues with a brief explanation of each (<b>E</b>). Present the list in bullet points for clarity (<b>B</b>). Once this part is complete, I will provide further instructions for the next steps."</p> <p><u>Example Response for the First Part:</u></p> <ol style="list-style-type: none"> <li>1. Climate change impacts on biodiversity – Explanation...</li> <li>2. Plastic pollution in marine environments – Explanation...</li> </ol>

	<ol style="list-style-type: none"><li>3. Deforestation and habitat loss – Explanation...</li><li>4. Air pollution and public health – Explanation...</li><li>5. Soil degradation and food security – Explanation...</li></ol> <p><u>Continuing the Task:</u></p> <p>"Thank you for the list. Now, for each of the issues identified, I need you to brainstorm potential research questions that could be explored. Provide two research questions for each issue."</p>
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### 3.6 Simple Tasks

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Activity type	Page
Contents	<p>Simple tasks, such as editing for grammar, querying basic information, or coding support, do not always require the full application of the BRAVE(R) framework because they are straightforward and have a narrow focus. However, these tasks can still be highly effective learning experiences. For example, by asking a LLM, such as ChatGPT, to identify informal language and suggest academic alternatives, or to correct punctuation errors and explain the rules, you can actively engage with the material and enhance your understanding of formal academic writing. Similarly, coding-related queries, such as debugging, learning specific coding concepts, or refining code snippets, can be addressed with targeted prompts that break down complex processes into simpler steps.</p> <p>*Remember never to put private, unpublished, patient, or patented data/information into these tools!</p> <p><b>Example for Writing:</b></p> <p>"As an AI tutor for a master's student, can you please identify any informal language in the following text and suggest a more academic alternative [Role]. Can you also please explain why these changes improve the text? The response should help me understand the importance of formal language in academic writing [Expectations &amp; Audience]."</p> <p><b>Example for Punctuation:</b></p> <p>"As an AI writing tutor, please review the following text for incorrect punctuation [Role]. Can you please identify any errors, provide corrections, and explain the rules for this change. This feedback is aimed at helping me (a master's student) learn and improve my writing skills [Expectations &amp; Audience]."</p>



	<p><b>Example for Coding:</b></p> <p><b>Task:</b> Learning code, creating coding assignments, or creating and explaining code snippets.</p> <p>"As an AI coding tutor, please explain how the following code works and suggest any improvements [Role]. I am a beginner in (programming language), and I would like to better understand the code's structure and potential optimisations [Expectations &amp; Audience]."</p> <p><b>Task:</b> Solving coding errors.</p> <p>"I encountered an error in my code. Here is the code and the error message (paste the code and error). Could you help me identify and resolve the issue? [Role]. Please explain the solution and steps taken so that I can avoid this mistake in the future [Expectations &amp; Audience]."</p> <p><b>Task:</b> Support during script writing.</p> <p>"I am working on a (programming language) script. Can you guide me step-by-step in building the script from scratch to achieve (desired outcome)? [Role]. I am looking for explanations at an intermediate level to improve my understanding of how these functions interact [Expectations &amp; Audience]"</p> <p>For coding tasks, tools like ChatGPT, Github Copilot, Tabnine, and CodiumAI can assist in different aspects. When learning to code or creating code assignments, targeted instructions using ChatGPT or Github Copilot can provide guidance and step-by-step breakdowns. For solving coding errors, copying the code and error message into ChatGPT often results in clear problem-solving steps. For testing and fine-tuning code, or creating detailed code documentation, tools such as CodiumAI are effective.</p>
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### 3.7 Reverse Prompting

3.7 Reverse Prompting	
<i>Activity type</i>	Page
<i>Contents</i>	<p><b>Reverse Prompting:</b></p> <p>When you struggle with thinking about what you want to ask. You can ask GenAI to help you write your prompt.</p> <p>"ChatGPT, I'm trying to create a prompt that will help me summarize key concepts in genetic engineering for an essay I'm writing. Can you guide me on how to formulate a prompt that will yield a concise but comprehensive summary?"</p>

## 3.8 Personalising your ChatGPT

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Activity type	Page
Contents	<p><b>Personalising your ChatGPT</b></p> <p>One way to help reduce the length and effort put into each prompt is by customising your chat. To customise your chat in ChatGPT, you need to go to your <i>Account Settings</i> found at the bottom of your chat history. Click on your name and a menu will appear. Click on <i>Custom Instructions</i> and a new window will open asking you to fill out two questions.</p> <p><b>1. What would you like ChatGPT to know about you to provide better responses?</b></p> <p>Here you could put: <i>"I am a master's student in [topic] and am studying in the Netherlands."</i></p> <p><b>2. How would you like ChatGPT to respond?</b></p> <p>This is where you need to provide a bit more information. For example:</p> <p><i>"You can call me [name] and I am a non-native English speaker so need a bit of help with my grammar. At my university we use British English. I would like you to provide graduate level responses, but do not use over complicated language. I would also prefer you to remain neutral during queries and would like to understand multiple perspectives."</i></p> <p>At the bottom of the page, you can then enable these custom instructions for chats. You can always turn this function off if you do not like the responses or you can adjust your instructions as you see fit.</p>