From Manual to Magical

Hands-on Practice & Creating Your AI Research Agent

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# Welcome Back!

**What We’ll Do:**

* Practice the workflow hands-on
* Analyse real(istic) food science data
* Create your own AI research agent
* Level up your research game

**What You Need:**

* Microsoft Copilot access
* One of our datasets
* Your curiosity!
* **A research topic in mind**

**Today’s Goal:** By the end, you’ll confidently use AI for your own research projects!

# System Check & Troubleshooting

**Quick Tech Inventory**

**✅ Can you access:**

* Microsoft Copilot (copilot.microsoft.com)
* File download capability
* New chat sessions

**Common Issues & Quick Fixes**

| Problem | Solution |
| --- | --- |
| “Response seems generic” | Add “Be specific” to prompts |
| “AI is confused” | Start new chat session |
| “Access denied” | Try incognito/private browsing |

**Help available:** Raise your hand anytime - we’ll have micro-breaks every 15 minutes!

# Quick Recap: The 10-Step Workflow

| Step | Task | Time | Output |
| --- | --- | --- | --- |
| 1 | Idea Generation | 8 min | 5 hypotheses table |
| 2 | Parallel Exploration | 12 min | 10-15 total ideas |
| 3 | Feasibility Testing | 10 min | Experimental plan + data |
| 4 | Optimisation | 15 min | Best parameters |
| 5 | Full Study | 15 min | Complete methodology |
| 6 | Component Analysis | 8 min | Key factors identified |
| 7 | Visualisation | 10 min | Figures + captions |
| 8 | Writing | 12 min | Full paper draft |
| 9 | Review | 5 min | Feedback report |
| 10 | Iteration | 5 min | Refined manuscript |

Today we’ll practice Steps 1-3 together, then learn to build systems to handle the rest!

# Let’s Get Started!

## Step 1: Idea Generation

**Everyone follow along:**

1. Open Microsoft Copilot
2. Copy this prompt exactly:

"What are some food science research ideas?"

# What Did You Notice? 🤔

* Did Copilot generate hypotheses?
* Were they all truly distinct?
* How was the formatting?
* Any surprising ideas?
* Quality of the abstracts?

# **The Problem We Experienced**

* Vague outputs? Missing context.
* Generic responses? No role assigned.
* Wrong format? Didn’t specify what you wanted.

# Introducing CRAFT: Better Prompts, Better Results

| Key | Section | Description |
| --- | --- | --- |
| **C** | **Context** | “This is food science research data…” |
| **R** | **Role** | “You are an expert food scientist…” |
| **A** | **Action** | “Generate 5 innovative hypotheses…” |
| **F** | **Format** | “Present as a structured table…” |
| **T** | **Tone/Target** | “Use academic language for peer review…” |

**Try it now:** Look at the earlier prompt. Which CRAFT elements were missing? How could you improve it?

**Remember:** CRAFT is your conversation starter, not your final answer. Follow up, refine, iterate!

# CRAFT Analysis

**❌ Before CRAFT (weak example):**

"What are some food science research ideas?"

or

"Give me some research ideas about plant milk."

**Missing:** - ❌ **Context:** No research level, paper type, or constraints - ❌ **Role:** AI doesn’t know what expertise to use - ❌ **Action:** Vague “some ideas” vs. specific “5 hypotheses” - ❌ **Format:** No structure for output - ❌ **Tone:** Unclear if academic, industry, or casual

# Let’s Get Started! (again!)

**Everyone follow along with YOUR topic:**

1. Open Microsoft Copilot
2. Use this CRAFT template with YOUR research area:

You are an AI research scientist specialising in Food Science.  
Given the following research area, generate 5 distinct and   
innovative scientific hypotheses suitable for a Masters-level   
research paper.  
  
For each hypothesis, include:  
- A clear Title  
- 3-5 Keywords   
- A short Abstract (under 200 words)  
- An explanation of its Novelty and Significance  
  
Research Area: "[YOUR TOPIC FROM HOMEWORK]"

# What Did You Notice?

**Share Your Observations**

* Did Copilot generate exactly 5 hypotheses?
* Were they all truly distinct?
* How was the formatting?
* Any surprising ideas?
* Quality of the abstracts?

**Key Learning:** Even with identical CRAFT structures, AI generates different outputs based on YOUR specific topic. This diversity is valuable!

# ✅ **CRAFT Analysis of This Prompt:**

| Element | ✅/❌ | What’s There |
| --- | --- | --- |
| **C**ontext | ✅ | “Given the following research area” + “Masters-level research paper” |
| **R**ole | ✅ | “You are an AI research scientist specialising in Food Science” |
| **A**ction | ✅ | “generate 5 distinct and innovative scientific hypotheses” |
| **F**ormat | ✅ | Detailed list: Title, Keywords, Abstract, Novelty explanation |
| **T**one/Target | ✅ | “scientific hypotheses” + “Masters-level” = academic tone |

**This is Actually a STRONG Prompt!**

**Why it works well:**

* **Specific role:** AI knows to think like a food science researcher
* **Clear task:** Exactly 5 hypotheses, not vague “some ideas”
* **Detailed format:** Structured output requirements
* **Appropriate level:** Masters-level sets the complexity
* **Rich context:** Specific research area provided

# Did it work?

**Success Check: ✅**

* Ideas are specific and detailed
* Academic language throughout
* Clear research questions

**Red Flags: ❌**

* Vague or generic suggestions
* Repetitive ideas
* No specific methodology mentioned

# Step 2: Scoring and Selection

**Copy your hypotheses back into Copilot**

**New CRAFT prompt:**

Here are 5 research hypotheses I generated.   
Please score each from 1-10 on:  
- Originality (1=common, 10=groundbreaking)  
- Feasibility (1=impossible, 10=easily doable for Masters)   
- Potential Impact (1=minor contribution, 10=field-changing)  
  
Present as a table with total scores and recommend the top 3.  
Explain your reasoning for the scores.  
  
[PASTE YOUR 5 HYPOTHESES HERE]

**Take 3 minutes to run this, then we’ll discuss results**

**Question:** Which hypothesis scored highest? Do you agree with the AI’s reasoning?

# Step 3: Feasibility Testing

**Let’s Design an Experiment!**

**Select your top hypothesis and use this CRAFT prompt:**

I have selected this hypothesis:  
[PASTE YOUR #1 HYPOTHESIS]  
  
Design a minimal, step-by-step experimental plan to test   
its basic feasibility. This should be a small-scale   
prototype, not a full study.  
  
Include:  
- Materials needed (be specific about equipment)  
- Step-by-step procedure (numbered list)  
- Expected measurements and units  
- Estimated timeline with milestones  
- Budget estimate (if possible)  
- Potential challenges and solutions  
  
After the plan, generate a small table of simulated   
data (5-10 rows) showing what results we might expect.

# **Success Metrics for Steps 1-3**

**Your outputs should have:**

**✅ Quality Indicators:**

* Specific numerical values
* Clear timelines
* Detailed procedures
* Realistic resource needs
* Academic language

**❌ Warning Signs:**

* Vague instructions
* Unrealistic timelines
* Missing key details
* Generic recommendations
* No specific measurements

# Quick Self Assessment

**Quick Poll: How Are We Doing?**

* 🟢 **Green:** My outputs are detailed and actionable
* 🟡 **Yellow:** Some good parts, some vague parts
* 🔴 **Red:** Most outputs are too generic

**If you’re yellow/red:** Try adding “Be more specific” to your prompts!

# Working with Real Data (Optional Demo)

**If You Have Data to Practice With…**

**For those who brought data or want to try our sample datasets:**

1. **Upload your CSV** to Copilot
2. **Ask basic questions** about patterns and trends
3. **Request simple visualisations**
4. **Generate interpretations**

# Sample CRAFT prompt for data:\*\*

I've uploaded a food science dataset from [study type/context].   
You are an experienced data analyst specialising in food research.   
Summarise the key findings and suggest 3 areas for deeper   
investigation that would be suitable for follow-up studies.   
Present as bullet points suitable for a research meeting,   
with each point including a brief rationale.

**Remember:** Always verify AI interpretations of your data!

# C.R.A.F.T Analysis

| Element | ✅/❌ | What’s There |
| --- | --- | --- |
| **C**ontext | ✅ | “I’ve uploaded a dataset form [study/type]” |
| **R**ole | ✅ | “You are an experienced food research data analyst” |
| **A**ction | ✅ | “Summarise key findings and suggest 3 areas for deeper investigation” |
| **F**ormat | ✅ | “Present as bullet points” |
| **T**one/Target | ✅ | “suitable for a research meeting and rationale” (professional/academic tone) |

**Why This Works Well:**

* **Clear context** about the data type
* **Specific role** that guides AI’s analytical approach
* **Dual action** with exact quantity (3 areas)
* **Defined format** (bullet points)
* **Audience-specific tone** (research meeting = professional)

# Building Your Research Process

**From Manual Steps to Systematic Approach**

**What we just did manually:**

* Step 1: Generated ideas with specific prompts
* Step 2: Evaluated and ranked systematically
* Step 3: Designed feasibility studies

**How to make this repeatable:**

1. **Save your successful prompts** in a document
2. **Create templates** for your research area
3. **Build prompt libraries** for different tasks
4. **Develop your personal workflow**

**The goal:** Turn today’s manual process into your efficient research system

# Advanced CRAFT Techniques

**Beyond the Basics**

**Prompt Chaining:**

1. “Generate 5 hypotheses about [topic]”
2. “Score the above hypotheses for feasibility”
3. “Design an experiment for the top-ranked hypothesis”

**Role Switching:**

* “As a journal reviewer, critique this hypothesis”
* “As an industry expert, assess commercial potential”
* “As a student, explain this in simple terms”

**Iterative Refinement:**

* “Make this more specific”
* “Add industry applications”
* “Consider budget constraints”
* “Include potential risks”

# Your Personal Prompt Library

**Start Building Today**

**Essential Templates to Save:**

**Idea Generation:**

You are an AI research scientist specialising in [FIELD].  
Generate [NUMBER] innovative hypotheses for [LEVEL]-level   
research on [TOPIC]. Include title, keywords, abstract,   
and significance for each.

**Literature Review:**

You are an academic researcher. Summarise the current state   
of research on [TOPIC]. Identify 3 key gaps that warrant   
further investigation. Use academic tone suitable for   
peer review.

**Methodology Design:**

Design a [SCALE] experimental protocol to test [HYPOTHESIS].  
Include materials, procedures, measurements, timeline, and   
expected challenges. Present as a structured research plan.

# Quality Control and Verification

**Your AI Safety Checklist**

**Always Check:** - ✅ Do the numbers make scientific sense? - ✅ Are the methodologies appropriate for the question? - ✅ Do timelines and budgets seem realistic? - ✅ Are safety and ethical considerations included? - ✅ Can you actually access the suggested equipment/materials?

**Red Flags:** - ❌ Unusually perfect or round numbers - ❌ Methodologies that seem too complex or too simple - ❌ Missing safety protocols - ❌ Unrealistic timelines or budgets - ❌ Citations you can’t verify

**When in doubt:** Ask a follow-up question or consult with supervisors

# Reflection Moment

**What You’ve Accomplished Today**

**In 30 minutes of hands-on practice:** - ✅ Generated research hypotheses for YOUR topic - ✅ Systematically evaluated and ranked ideas - ✅ Designed feasibility studies - ✅ Learned CRAFT framework for better prompts - ✅ Built your personal prompt templates

**Traditional Approach Time:** - Literature review to find gaps: 2-3 weeks - Hypothesis development: 1-2 weeks - Initial experimental design: 1 week - **Total: 4-6 weeks**

**But remember:** AI accelerates the process - human expertise ensures quality and makes final decisions

# Integration with Your Studies

**Making This Work in Real Research**

**This Week:**

1. **Apply the 3-step process** to your current assignments
2. **Build your prompt library** with successful templates
3. **Practice CRAFT framework** on different topics
4. **Share successes** (and failures!) with classmates

**This Month:**

* Use for literature reviews and research proposals
* Apply to lab report writing and data interpretation
* Integrate with thesis planning and development
* Develop field-specific prompt variations

**This Semester:**

* Build comprehensive research workflows
* Create collaboration templates for group projects
* Develop peer review and feedback processes

# Best Practices for Long-term Success

**Sustainable AI-Assisted Research**

**Do:**

* ✅ **Always verify** AI outputs with peer-reviewed sources
* ✅ **Keep humans central** to all strategic decisions
* ✅ **Document your processes** for reproducibility
* ✅ **Iterate and improve** based on results
* ✅ **Cite AI assistance** appropriately in academic work

**Don’t:**

* ❌ **Accept first outputs** without refinement
* ❌ **Use AI for final decisions** without human judgment
* ❌ **Skip verification** of facts and figures
* ❌ **Plagiarise or misrepresent** AI-generated content
* ❌ **Ignore institutional** AI policies

# Ethical Guidelines & Academic Integrity

**Using AI Responsibly in Research**

**Required Citation Example:**

“Research methodology development was assisted by Microsoft Copilot (Microsoft Corporation, 2024). All generated hypotheses and experimental designs were subsequently validated against peer-reviewed literature and refined through expert consultation.”

**What to Always Cite:**

* ✅ Hypothesis generation assistance
* ✅ Experimental design suggestions
* ✅ Data analysis approaches
* ✅ Writing structure and organisation

**Institution-specific guidelines:** Always check your university’s AI policy - requirements may vary!

# Next Steps & Advanced Applications

**Your Research Journey Continues**

**Immediate Actions:**

1. **Finish your prompt library** with today’s successful templates
2. **Apply the workflow** to a real research question this week
3. **Experiment with CRAFT variations** for different purposes
4. **Document what works** and what doesn’t

**Advanced Applications:**

* Multi-study research planning
* Grant proposal development
* Conference presentation creation
* Peer review simulation
* Research collaboration planning

**Community Building:** Consider forming study groups to share AI research techniques and improve workflows together

# Troubleshooting & Support

**When Things Don’t Work**

**Common Issues & Solutions:**

| Issue | Quick Fix | Long-term Solution |
| --- | --- | --- |
| Generic responses | Add “Be specific with examples” | Develop more detailed CRAFT prompts |
| Forgets context | Start new chat session | Use structured conversation management |
| Wrong methodology | Cross-check with known methods | Build domain expertise verification |
| Can’t upload data | Try different browser/platform | Have multiple platform accounts |

**Remember:** Technology fails sometimes. The workflow principles remain valuable even when specific tools don’t cooperate!

**Measuring Your Progress**

**By the end of today, you should be able to:** - ✅ Use CRAFT framework to write effective research prompts - ✅ Apply the 3-step workflow to any research topic - ✅ Critically evaluate AI-generated research suggestions - ✅ Build and maintain your personal prompt library - ✅ Integrate AI tools with traditional research methods

**Self-Assessment Questions:** 1. Can you explain CRAFT to a colleague? 2. Do you feel confident starting a research project with AI assistance? 3. Can you identify when AI outputs need human verification? 4. Would you recommend this approach to other researchers?

**Success indicator:** You’re excited to apply this to your own research, not overwhelmed by the complexity!

# Thank You!

**You’re Now AI-Empowered Researchers!**

## Remember: Amplification, Not Replacement

You’re not replacing your scientific expertise—you’re amplifying it with powerful AI tools that handle routine tasks so you can focus on creative thinking and critical analysis.

**The Journey Continues:** - **Today:** You learned structured workflows and CRAFT framework - **Tomorrow:** You apply them to real research challenges  
- **Next month:** You’re mentoring others in AI-assisted research - **Next year:** You’re publishing papers that showcase human-AI collaboration

**Created with assistance from Claude (Anthropic)** - *demonstrating responsible AI collaboration*

**Happy Researching!** 🚀

**All course materials, including presentations, datasets, interactive tools, and resources, available at:** [GitHub Pages URL]