

From Manual to Magical

Hands-on Practice & Creating Your AI Research Agent

Michael Borck

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
Context		"Given the following research area" + "Masters-level research paper"
Role		"You are an AI research scientist specialising in Food Science"
Action		"generate 5 distinct and innovative scientific hypotheses"
Format		Detailed list: Title, Keywords, Abstract, Novelty explanation
Tone/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
Context		"I've uploaded a dataset from [study/type]"
Role		"You are an experienced food research data analyst"
Action		"Summarise key findings and suggest 3 areas for deeper investigation"
Format		"Present as bullet points"
Tone/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]