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Title

Developing Scalable Library Research Training: Search Protocols, Modular Learning, and AI-Assisted Support

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Peer reviewed

Developing Scalable Library Research Training

Search Protocols



Modular Learning



AI-Assisted Support

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This presentation shares a UC San Diego Library effort to expand access to medical library research training and make it easier to scale.

The approach combines three core elements: structured search protocols, modular learning tools, and early experiments with AI-assisted support.

Project Overview

Rethinking library instruction as scalable, self-directed learning

Feature	What It Offers
Structured Protocol	Step-by-step research guidance
Modular Learning	Multi-format tools for different learners and settings
AI Chatbot Prototype	Structured support for literature searching

The goal is to shift library research training toward a more scalable, learner-centered model.

It begins by rethinking instruction—moving from traditional classroom formats to self-directed learning that supports users step by step.

The first focus is on developing structured library research protocols. These guide learners through the research process in a clear, linear way.

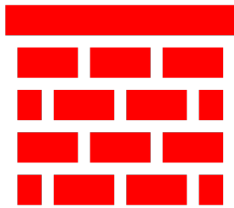
Those protocols are then transformed into modular learning tools, adapted into multiple formats to support a range of clinical settings and users.

Finally, the project explores how this design can support AI-assisted research guidance.

Using ChatGPT, it prototypes a chatbot built on the search protocol to deliver step-by-step support for developing a literature search.

Challenges

Traditional classroom instruction is:



- ✗ Time-intensive
- ✗ Not flexible to learning goals or preferences
- ✗ Hard to revisit or build on

Library research training has traditionally been delivered through live classroom sessions—either in person or online.

While effective, these sessions are time-intensive and hard to scale. They're also difficult to adapt to learners with different goals, preferences, or levels of experience.

There's a need for training that works beyond the live classroom—for learners who need research guidance they can revisit and build on over time.

Scalable Library Research Training



Broader Reach

Across programs and skill levels



Adaptable Formats

Fits different learning contexts



Less Real-time Support

Reduces need for live instruction



Flexible Use

Works for individuals or groups

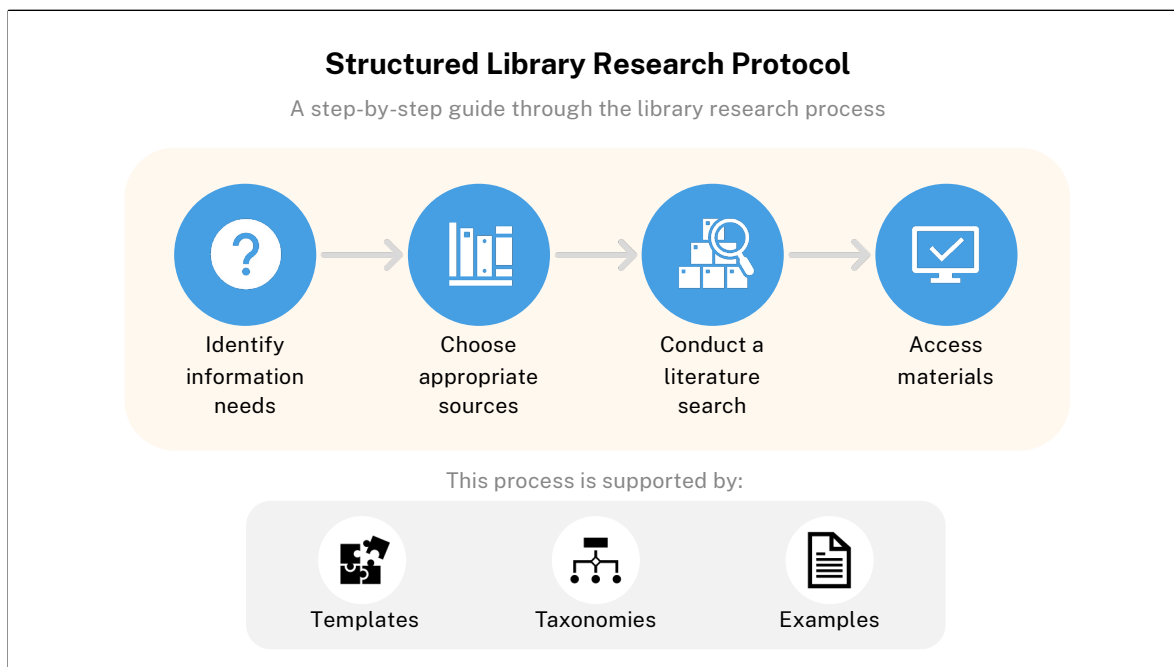
The objective was to create a scalable model for library research training.

In this context, scalability means reaching more learners – across programs, locations, and skill levels – without increasing the need for live librarian support.

A scalable model should work across formats, adapt to different learning contexts, and stay effective whether used by one person or many.

These traits formed the foundation of the project's development.

Part 1:
Structured Library Research Protocol



This approach centers on a structured library research protocol – a step-by-step guide through the full research process using library tools.

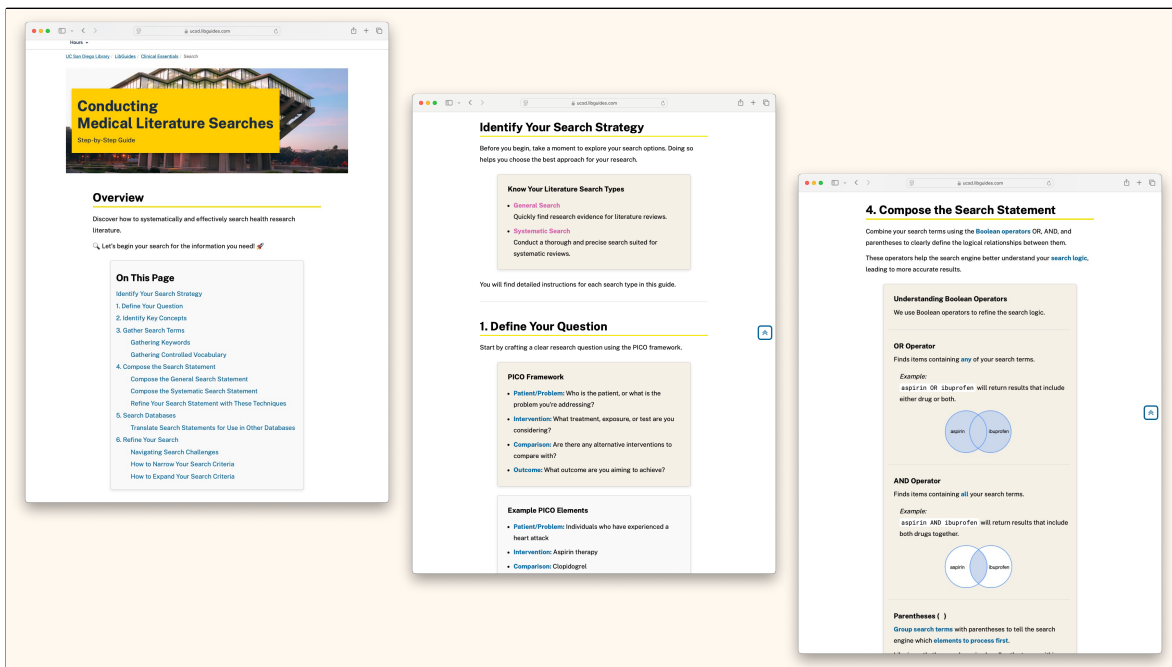
It leads learners through a clear sequence of manageable actions: identifying information needs, selecting appropriate sources, conducting a literature search, and accessing materials.

This process is supported by templates, taxonomies, and examples – providing structured guidance for self-directed learners.



A key component is the literature search protocol.

It presents a linear workflow that walks users through each stage of the search process - from defining a research question to developing and refining a search strategy.



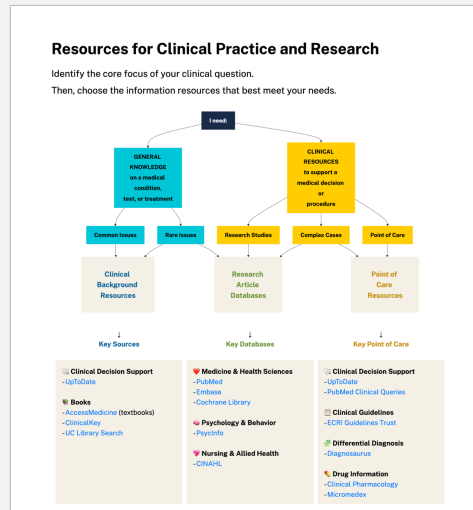
These steps can be difficult to explain clearly in a single class session.

The protocol lays them out in a logical order that's easy to follow – and easy to return to – especially for learners working independently.

Information Needs Taxonomy

Identify need

Match to best resource



Let's look at the structural elements that makes the protocol easier to follow.

The first is the information needs taxonomy—a visual guide that helps users identify what kind of information they're looking for.

Once the need is clear, the taxonomy connects it to the right resource type.

It doesn't just tell users where to go—it shows them why and when to use each resource.

Search Heuristics

Guide decisions
Handle challenges

Navigating Search Challenges

While searching the literature, you might run into some common challenges. Here's how to handle them:

Challenge	Strategy
Irrelevant results	Narrow your search criteria to focus on more specific studies
Limited results	Expand your search criteria to include a broader range of studies

Techniques to Narrow Your Search	
Technique	Description
Apply Database Filters	Limit results by date range, age group, article type, and more. <i>Note: If you're doing a systematic review, it's best to avoid these filters.</i>
Use Phrase Searches	Place exact phrases in double quotes, e.g., "kidney failure"
Conduct Field Searches	Target specific sections like the title, abstract, or controlled vocabulary.
Choose a More Specific Idea	For example, use arrhythmia instead of the broader term heart disease .
Add More Concepts	Incorporate additional concepts from your research question.
Use Search Filters	Apply pre-defined criteria to focus on specific research characteristics.

Another structural element is the set of search heuristics—simple rules and shortcuts that guide users in shaping their search strategies.

These help learners make decisions more easily and handle common challenges during the search process.

Templates

Structure the search
Organize terms clearly

Systematic Search Statement Formula

For use exclusively in [PubMed](#):

```
(Concept #1[tiab] OR Synonyms[tiab] OR  
Related Terms[tiab] OR Controlled  
Vocabulary[mh]) AND (Concept #2[tiab] OR  
Synonyms[tiab] OR Related Terms[tiab] OR  
Controlled Vocabulary[mh])
```

Another structural element is the set of fill-in-the-blank templates.

These give learners a clear and organized way to draft their search strategies.

Worked Examples

Show steps in action

Reinforce learning

Example Search Terms

Concept	Keywords	MeSH
heart attack	cardiac infarction myocardial infarction	myocardial infarction
aspirin	acetylsalicylic acid	aspirin

Example: Systematic Search Statement for PubMed

For our search on heart attack and aspirin, we use:

```
("heart attack*[tiab] OR "cardiac  
infarct*[tiab] OR "myocardial infarct*"  
[tiab] OR "myocardial infarction"[mh])  
AND (aspirin[tiab] OR "acetylsalicylic  
acid"[tiab] OR aspirin[mh])
```

Finally, the protocol includes worked examples—realistic walkthroughs that show what each step looks like in action.

These examples reinforce structured learning by modeling the search process.

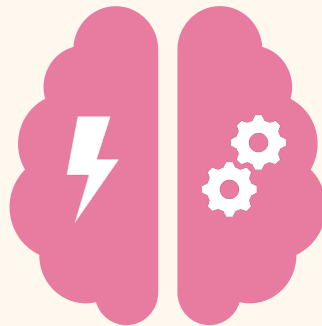
Altogether, the structured elements of the protocol help learners build search skills more independently and with a clearer sense of the process.

Supporting Cognitive Strategies

System 1

Fast, intuitive

Supported by:
heuristics, visuals



System 2

Slow, analytical

Supported by:
templates, taxonomies, examples

Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.

The protocol is also designed to reflect how people naturally think and solve problems—based on dual process theory.

This theory describes two types of thinking:

- System 1 is fast and intuitive.
- System 2 is slower and more analytical.

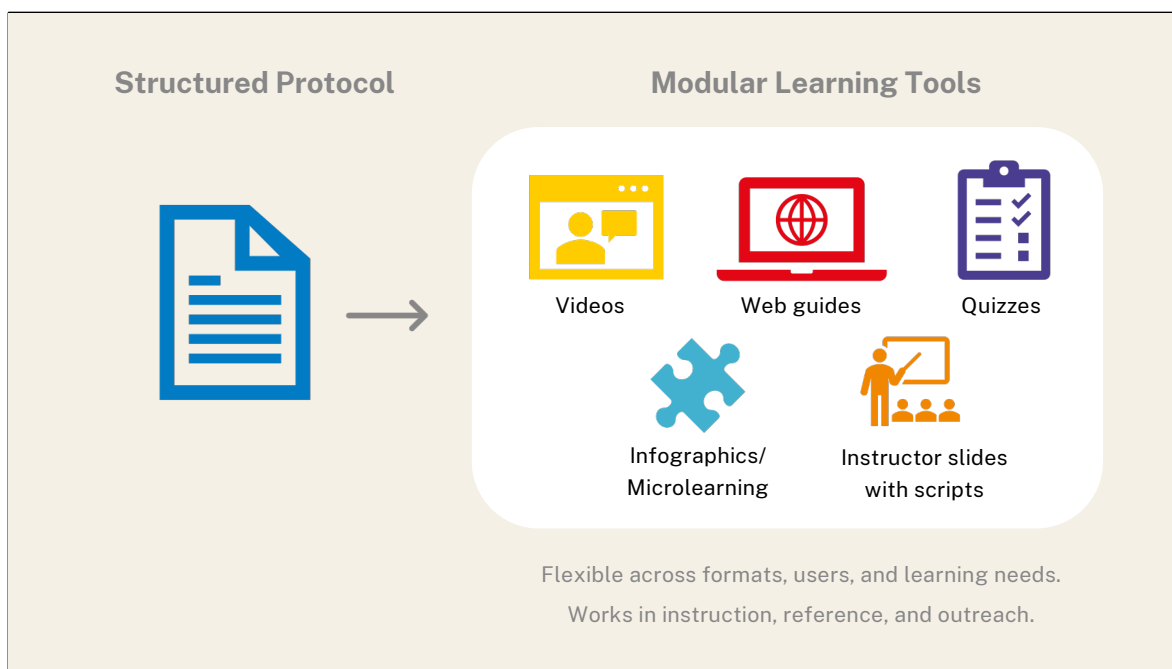
The protocol supports System 1 thinking through heuristics and visual cues. These help learners make quick, intuitive choices.

It supports System 2 thinking by breaking complex tasks into a clear, step-by-step sequence. It provides structure for more deliberate, analytical problem-solving.

This balance may help reduce cognitive load and make the research process easier, especially for self-directed learners.

Part 2:

Modular Learning Tools



Let's look at the second part of this project: transforming the structured protocol into modular learning tools.

Distinct parts of the protocol were adapted into standalone training resources. Each focuses on a specific research task and can be used independently or combined into a learning sequence.

Each module was then developed in multiple formats—such as videos, web guides, quizzes, infographics and microlearning content, and instructor slides with scripts.

This modular approach offers flexible, reusable guidance – designed to work across different formats, audiences, and learning needs.

These tools also support use in instruction, reference, and outreach.

Let's take a quick look at the types of tools available.

Modular Learning Tools

Tutorial Videos

For self-directed learning

Tutorial 1

Find medical information at the Library



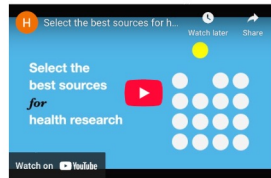
Learn how to connect to the UC San Diego network, search for publications and information sources, and get full-text access.

[View the slides and transcript](#)

[Download the PowerPoint file](#)

Tutorial 2

Select the best sources for health research



Learn how to select the best medical sources for your clinical questions and ensure the information is reliable.

[View the slides and transcript](#)

[Download the PowerPoint file](#)

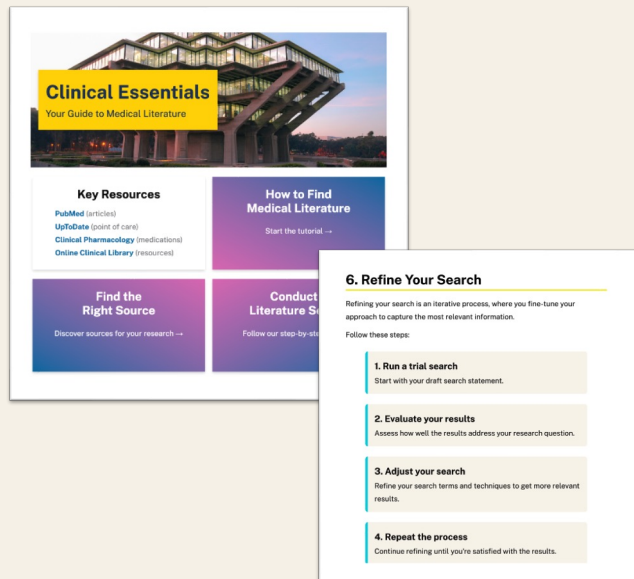
ucsd.libguides.com/clinical/find-medical-literature

The tutorial videos support users learning on their own. Each one walks through a specific step of the research process.

Modular Learning Tools

Web Guides

For on-demand reference



ucsd.libguides.com/clinical/search

The web-based guides are available anytime for quick reference. They're helpful when learners need a refresher.

Modular Learning Tools

Quiz

For self-evaluation and
recommendations

Library Skills Quiz

Test your medical literature search skills and receive personalized training recommendations.

[Sign in to Google](#) to save your progress. [Learn more](#)

QUESTION 6 0/1

Which search statement is most suitable for a thorough literature search on the following research question:

In individuals who have experienced a heart attack, is aspirin more effective than clopidogrel in preventing further heart attacks?

☒ heart attack OR myocardial infarction AND aspirin OR acetylsalicylic acid X

☐ (heart attack AND myocardial infarction) OR (aspirin AND acetylsalicylic acid)

☐ (heart attack OR myocardial infarction) AND (aspirin OR acetylsalicylic acid)

Correct answer

☒ (heart attack OR myocardial infarction) AND (aspirin OR acetylsalicylic acid)

Feedback

Check out Tutorial 3 to learn more about incorporating Boolean operators into your search statements for effective search logic.

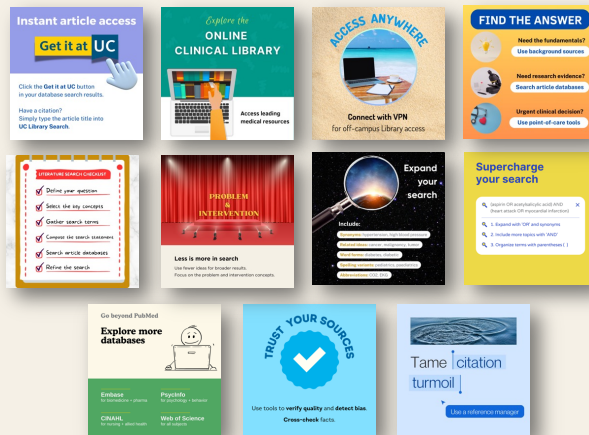
<https://ucsd.libguides.co...>

ucsd.libguides.com/clinical/find-medical-literature

The quiz helps learners check their understanding and reflect on their skills. It also gives personalized suggestions for what to explore next.

Infographics & Microlearning

For quick learning



ucsd.libguides.com/clinical

Short, visual content—like infographics and microlearning materials—works well in newsletters, outreach, and social media.

They're ideal for quick review and learning.

Slides and Scripts for Teaching

Ready to use in class

Step 1. Connect to the UC San Diego network

Start by connecting your computer to the university network.

How you connect depends on where you are:

If you're on the UC San Diego campus, you have two options. You can use a university computer, like those in your department or lab – or connect your device to the "UCSD-PROTECTED" Wi-Fi.

If you're off campus, at home, or somewhere else, you will need to use the UCSD VPN, which stands for Virtual Private Network. It will securely connect you to the university.

Remember, only current students and employees can access the online library resources off-campus.

For Wi-Fi and VPN, log in with your Active Directory account – that's the same username and password you use for your university email.

Review Question

Match each information type with its recommended source.

	Clinical Pharmacology	UC Library Search (padding)	Pubmed
Research articles in the health sciences	☐	☐	☒
Drug information	☒	☐	☐
Books, journals, and other library materials	☐	☒	☐

Here are the correct answers.

ucsd.libguides.com/clinical/find-medical-literature

Instructor-ready slides with scripts are also available – so faculty can bring this material directly into their teaching.

Flexible, Scalable, and Learner-Driven



Modular design
supports diverse styles,
goals, and timelines



Works across
instruction, reference,
and outreach



Embedded in teaching
or discovered
independently



Scales without real-time
librarian support



Enables use of new tools
for research support

This modular approach is built for flexibility and scalability.

The materials support a wide range of learning styles, goals, and timelines—and they work across instruction, reference, and outreach.

They can be embedded into courses, used in consultations, or shared through outreach. They're also discoverable independently through search.

This model shifts from a librarian-led approach to a learner-driven one—supporting scalable research training without requiring real-time librarian involvement.

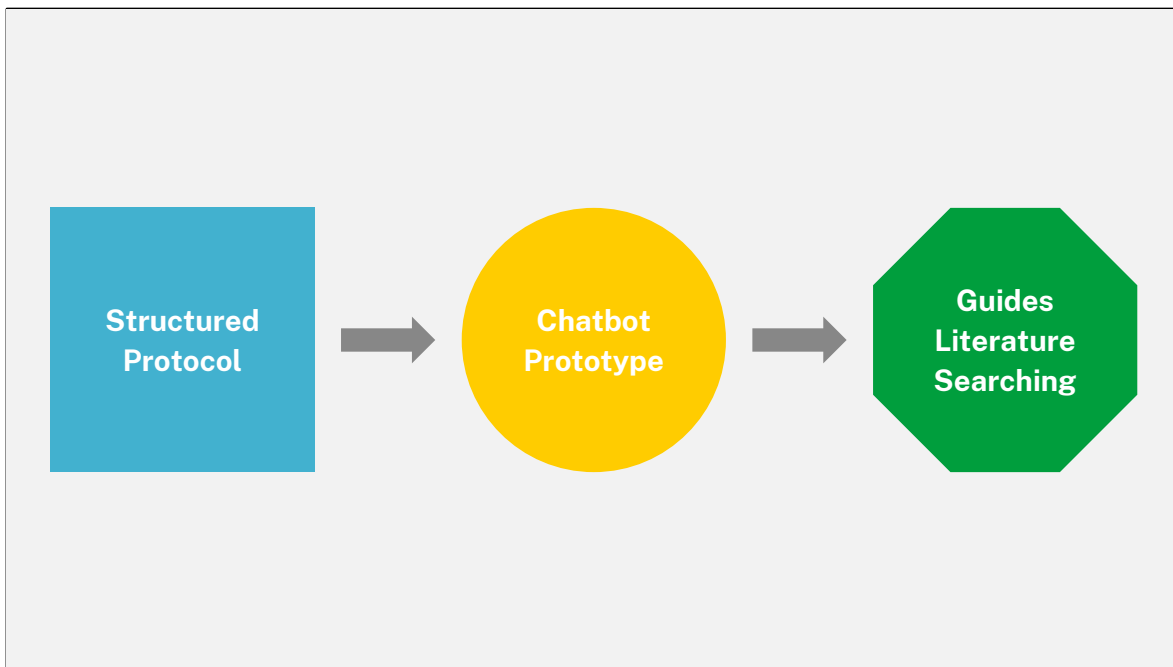
Learners can access and reuse the content at their own pace, as their needs evolve.

This flexible model also lays the groundwork for exploring how emerging tools—like generative AI—can support library research training.

Part 3: AI-Assisted Support Chatbot Prototype

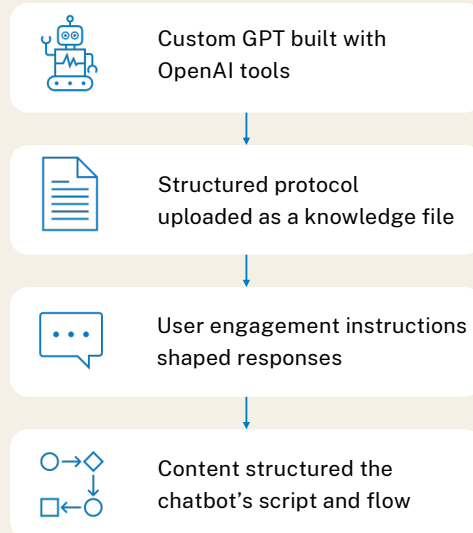
Finally, this project explored how AI could support library research training.

As more users experiment with generative AI tools, it's important to offer guidance grounded in library practices.



Built on the structured protocol, a prototype chatbot was developed to guide users step by step through the literature search process.

How the Chatbot Was Built



A prototype chatbot was developed using OpenAI's custom GPT tool.

The search protocol was uploaded as a knowledge file to provide step-by-step guidance.

User engagement instructions were also written to shape how the chatbot interacts and supports users through the search process.

For instance, limits were built in to prevent the chatbot from giving direct answers or straying off-topic. Its role is to guide—not complete—the search.

Because the structured search protocol was already clear and linear, with worked examples, it translated well into an instructional script the chatbot could follow.

Supporting Materials for This Custom GPT

<https://bit.ly/cb250415>

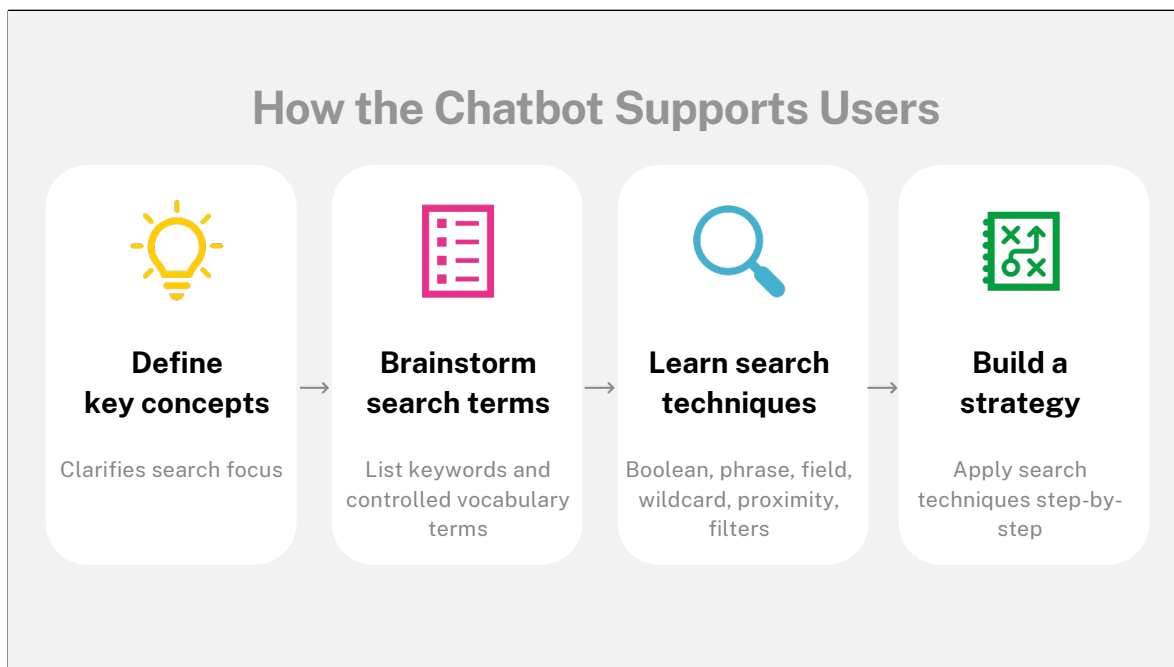
References

Levy, D., & Pérez Albertos, Á. (2024). *Teaching effectively with ChatGPT: A practical guide to creating better learning experiences for your students in less time*. Dan Levy and Ángela Pérez Albertos. → See Chapter 10

Cho, V. (2025, April 15). *Problem statement chatbot prompt*. Boston College Center for Digital Innovation in Learning: Digital Learning Design Toolkit. <https://cdil.bc.edu/resources/emerging-technologies/engaging-with-ai/chatbots/problem-statement-chatbot-prompt/>

Instructions and materials for developing this custom GPT are available at the link provided.

This setup followed guidance by Levy and Pérez Albertos, who outlined how to configure a custom GPT using defined interaction rules. A chatbot prompt developed by Cho also helped inform the approach.



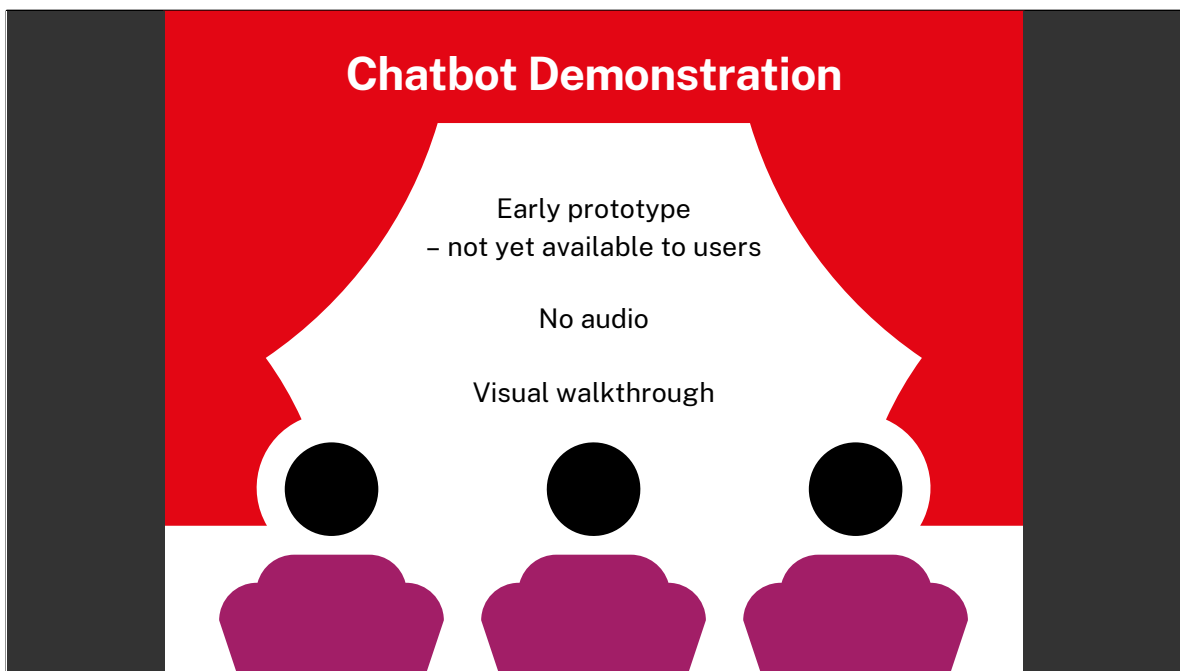
The chatbot follows the same process as the search protocol to support users step by step.

It starts by asking users to define their key concepts, one at a time.

Then it guides them to brainstorm and compile keywords and controlled vocabulary terms.

Next, it introduces core search techniques—like Boolean operators, phrase searching, field tags, wildcards, proximity searching, and filters.

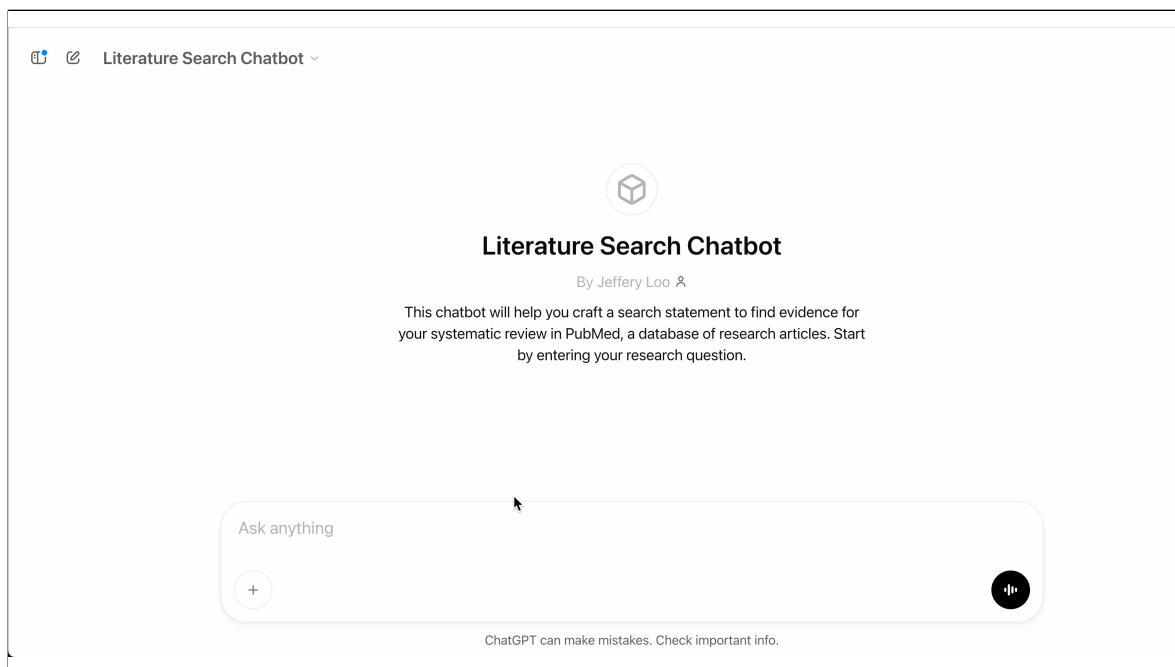
At each step, the chatbot helps apply these techniques to build a complete and structured search query.



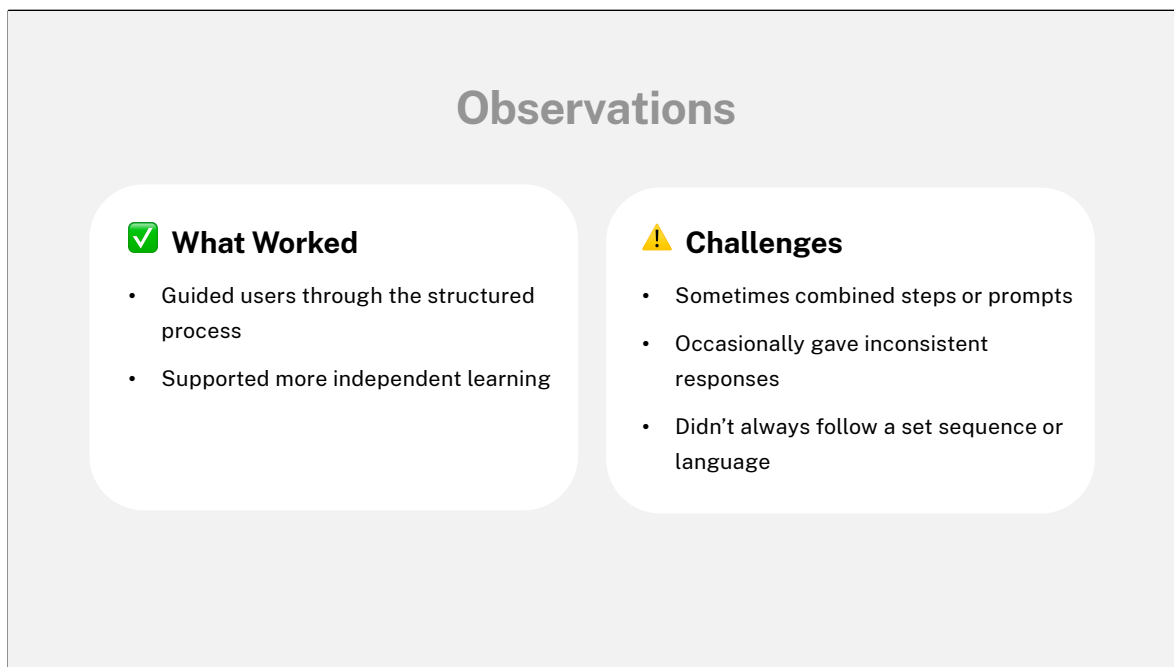
Next, you'll see a short demonstration of the chatbot in action.

This early prototype isn't yet available to users, but it offers a preview of what's possible.

There's no audio – just a visual walkthrough of how it works.



View the demo video at <https://youtu.be/blthrzc9Jqs>.



Early observations were encouraging.

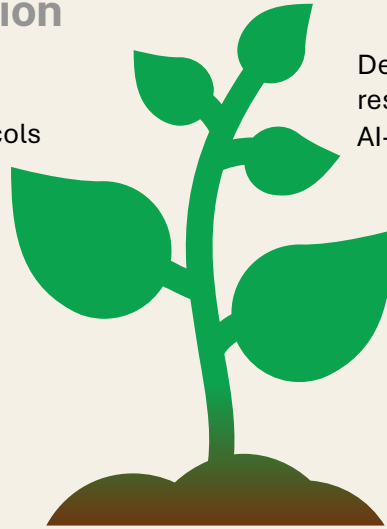
The chatbot was able to guide users through the structured search process and showed potential to support more independent learning.

There were also challenges. The chatbot sometimes combined steps and prompts, or gave inconsistent responses.

This highlights a key limitation: generative AI doesn't always follow a fixed instructional sequence or use consistent language.

Future Direction

Build on library-
designed protocols
and practices



Develop
responsible,
AI-driven tools

Support scalable
research guidance

Still, this pilot showed that a structured protocol can provide a strong foundation for developing AI-assisted tools in library research training.

Looking ahead, library-designed protocols and teaching practices can help shape responsible, AI-driven tools to support scalable research guidance.

Evaluation Highlights & What's Next

Highlights

- ✅ Positive feedback on structured tools
- 💬 AI chatbot prototype showed instructional potential

Next Steps

- 📊 Assess learning via quizzes, video, and feedback
- 🔧 Refine chatbot to follow workflows
- 🚀 Support scalable, self-directed research training

Wrapping up, here are early evaluation highlights and future plans for this project.

The structured protocol and modular tools received positive feedback from medical classes—for their clarity, step-by-step guidance, and flexibility.

The AI chatbot prototype showed promise in supporting guided search instruction.

Next steps include assessing learning through quiz results, video analytics, and feedback from training sessions.

The chatbot will continue to be refined to better follow instructional workflows.

Over time, this approach may support scalable, self-directed research training across different learning settings, needs, and platforms.

Key Takeaways



Structured protocol to guide the library research process

→ Step-by-step with templates, taxonomies, and examples



Modular learning tools built from the protocol

→ Support instruction, reference, and outreach across formats and needs



AI-assisted chatbot prototype using custom GPT

→ Early test of structured use of generative AI in library research guidance



Scalable model for flexible, independent learning

Supporting Materials

Structured Search Protocol
ucsd.libguides.com/clinical/search

Modular Learning Tools
ucsd.libguides.com/clinical

Chatbot Prototype Materials
bit.ly/cb250415

This project brings together three integrated parts: a structured library research protocol, modular learning tools, and an AI-assisted chatbot prototype.

Each is designed to support scalable, flexible research training—rooted in library practices.

The model can be adapted across disciplines, and the supporting materials offer more detail if you'd like to explore further.



And just for a poetic close, here's a summary in the form of a haiku.

Structure guides the way
Modules teach, chatbots relay
Grows in wide array

Thanks for watching.