



AI FOR RESEARCH: A HANDS-ON GUIDE

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DEVELOPING A RESEARCH IDEA



FORMULATION OF RESEARCH QUESTION

Ratan SK, Anand T, Ratan J. Formulation of research question–Stepwise approach. *Journal of Indian Association of Pediatric Surgeons*. 2019 Jan;24(1):15.

- “The most successful research topics are **narrowly focused** and carefully defined but are important **parts of a broad-ranging, complex problem.**”
- acronym “**FINERMAPS**”
 - feasible, interesting, novel, ethical, relevant, manageable, appropriate, potential value, publishability, and systematic

Table 1: Potential problems and solutions while making research question

Problem	Solution
Too broad	Specify lesser variables; narrow the question
Not enough subjects	Expand inclusion criteria; modify exclusion criteria; add other sources; lengthen study time
Methods beyond skill of investigator	Collaborate; learn skills
Too expensive	Fewer subjects/measurements; less expensive measurements; fewer follow-ups
Not interesting/ relevant	Consult with mentor/peers; modify research Q

FORMULATION OF RESEARCH QUESTION

Table 2: Examples of few bad (left-hand side column) and few good (right-hand side) research questions

Bad examples of research question

Very narrow: What is the protein-energy malnutrition in schoolchildren in Delhi?

This is too narrow because it can be answered with a simple statistic. Questions that can be answered with a “yes” or a “no” should also typically be avoided

Unfocused: What are the effects of protein-energy malnutrition in schoolchildren in New Delhi?

This question is so broad that research methodology would be very difficult and the question is too broad to be discussed in a typical research paper

Very objective: How much time do young children in Delhi spend doing physical activity per day?

This question may allow the researcher to collect data but does not lend itself to collecting data that can be used to create a valid argument because the data is just factual information

Too simple: How are school systems in various schools of Delhi addressing childhood behavioral problems?

This information can be obtained without the need to collect unique data. The question could be answered with a simple online search and does not provide an opportunity for analysis

Good examples of research question

Less narrow: How does the education level of the parents impact protein-energy malnutrition in schoolchildren of Delhi?

This question is more specific will lead to more meaningful research and the results would provide the opportunity for an argument to be formed

More focused: How does protein-energy malnutrition among children affect academic performance in elementary schoolchildren in Delhi?

This question has a very clear focus for which data can be collected, analyzed, and discussed

More subjective: What is the relationship between physical activity levels and childhood obesity?

This is a more subjective question that may lead to the formation of an argument based on the results and analysis of the data. It is interesting and relevant too

More complex: What are the effects of intervention programs in the elementary schools on the rate of childhood psychological health among 6th- 9th-grade students?

This question is more complex and requires both investigation and evaluation which will lead the research to form an argument that may be discussed. It is interesting and relevant

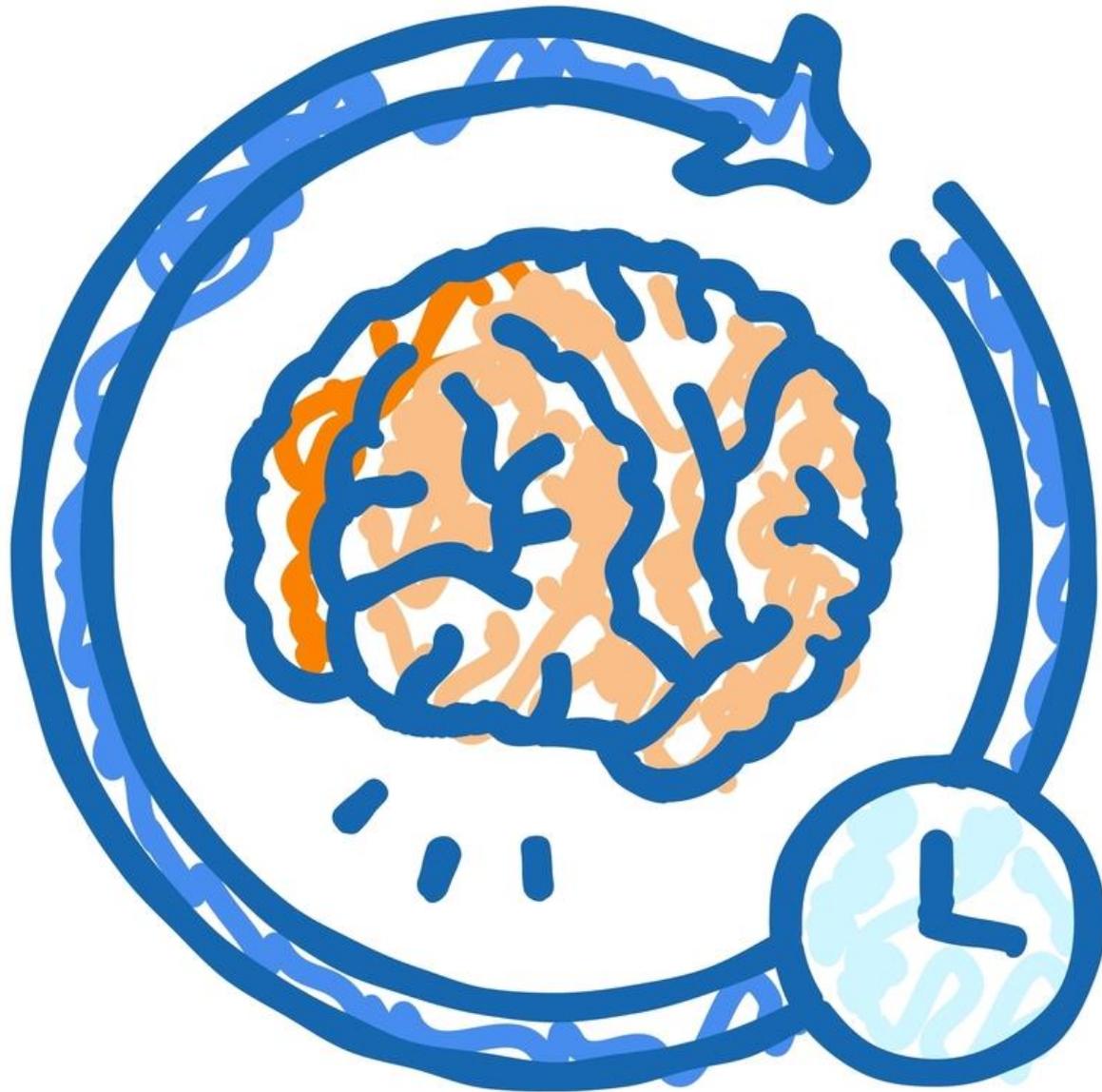
A FRAMEWORK FOR CONSTRUCTING AN APPROPRIATE QUESTION

Table 1 Overview of PICOTS and PPOTS

	PICO		PPO	
	Therapeutic	Diagnostic	Prognostic	
Patients	What patient group?	What patient group?	Patients	What patient group?
Intervention	In what surgical treatment, procedure, or implants are you interested?	What diagnostic procedure?	Prognostic factors	What <i>primary</i> prognostic (risk) factor might influence outcome?
Comparison	What is the comparison (control) treatment?	Is there a gold or suitable reference standard?		What <i>other</i> factors might influence outcome?
Outcomes	In what outcomes are you interested? (e.g., pain)	Are you interested in validity (e.g., sensitivity/specificity), and/or reliability (e.g., inter/intra rater reproducibility)	Outcomes	In what outcome(s) are you interested? (e.g., nonunion)
Timing	What follow-up times are important	Does timing of the test influence the outcome	Timing	What timing of follow-up or assessment of outcome is important (e.g., peri-operative)
Setting (or study design)	In what setting(s) is treatment performed (e.g., in the emergency department)	Under what conditions or locations (setting) is the diagnostic test performed?	Setting (or study design)	What conditions or settings are important to consider?

PICO (Patients, Intervention, Comparator, Outcomes) table for designing your question

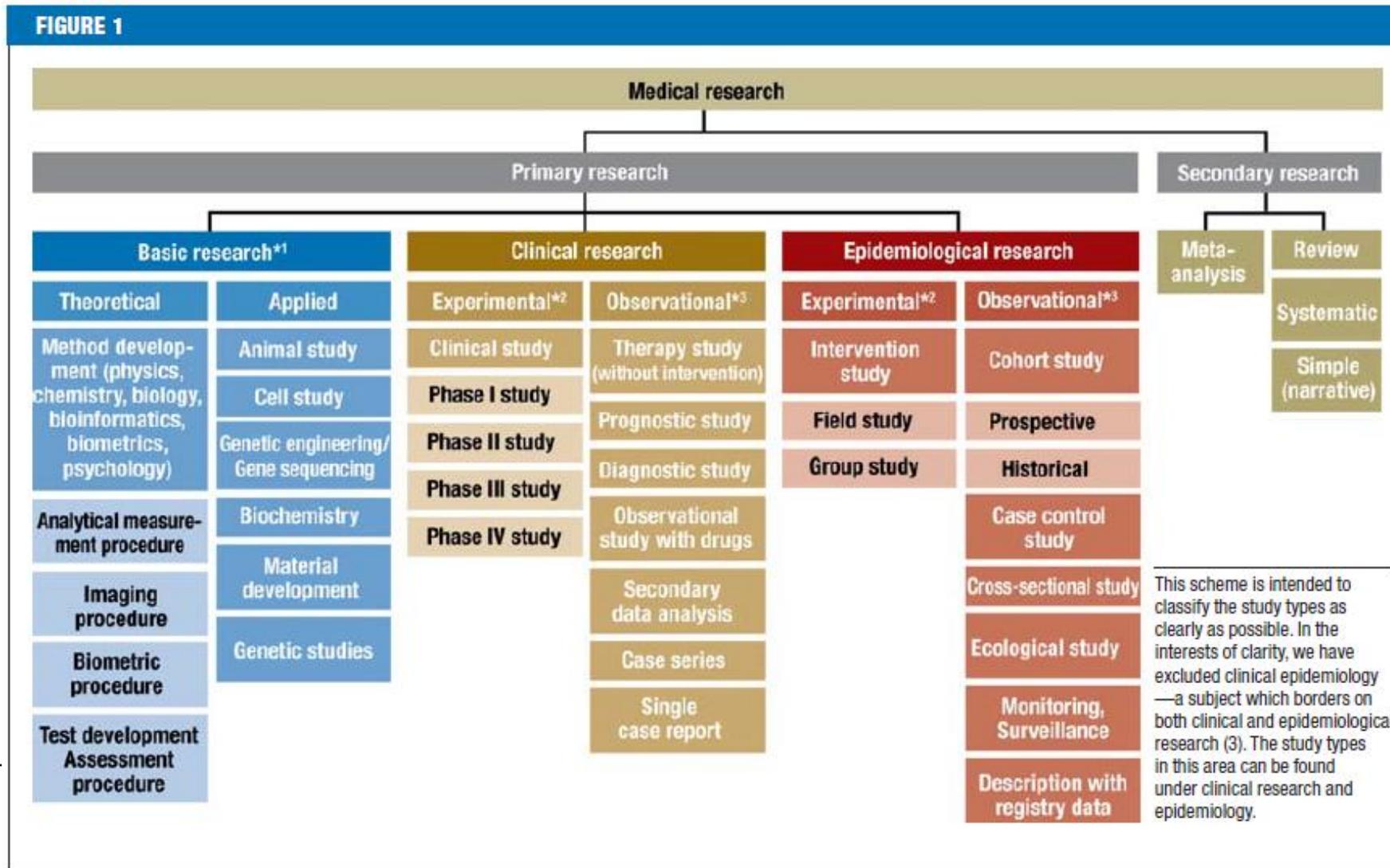
	Included	Excluded
Patients	Degenerative disc disease at one level of the lumbar spine	All other diagnoses (ie, tumor, trauma); 2- or 3-level disc disease; cervical disease
Intervention	Artificial disc replacement	
Comparator	Fusion	
Outcome	Death, infection, subsidence and migration, loss of disc height, heterotopic ossification and spontaneous fusion, reoperation	All other complications



WARM-UP

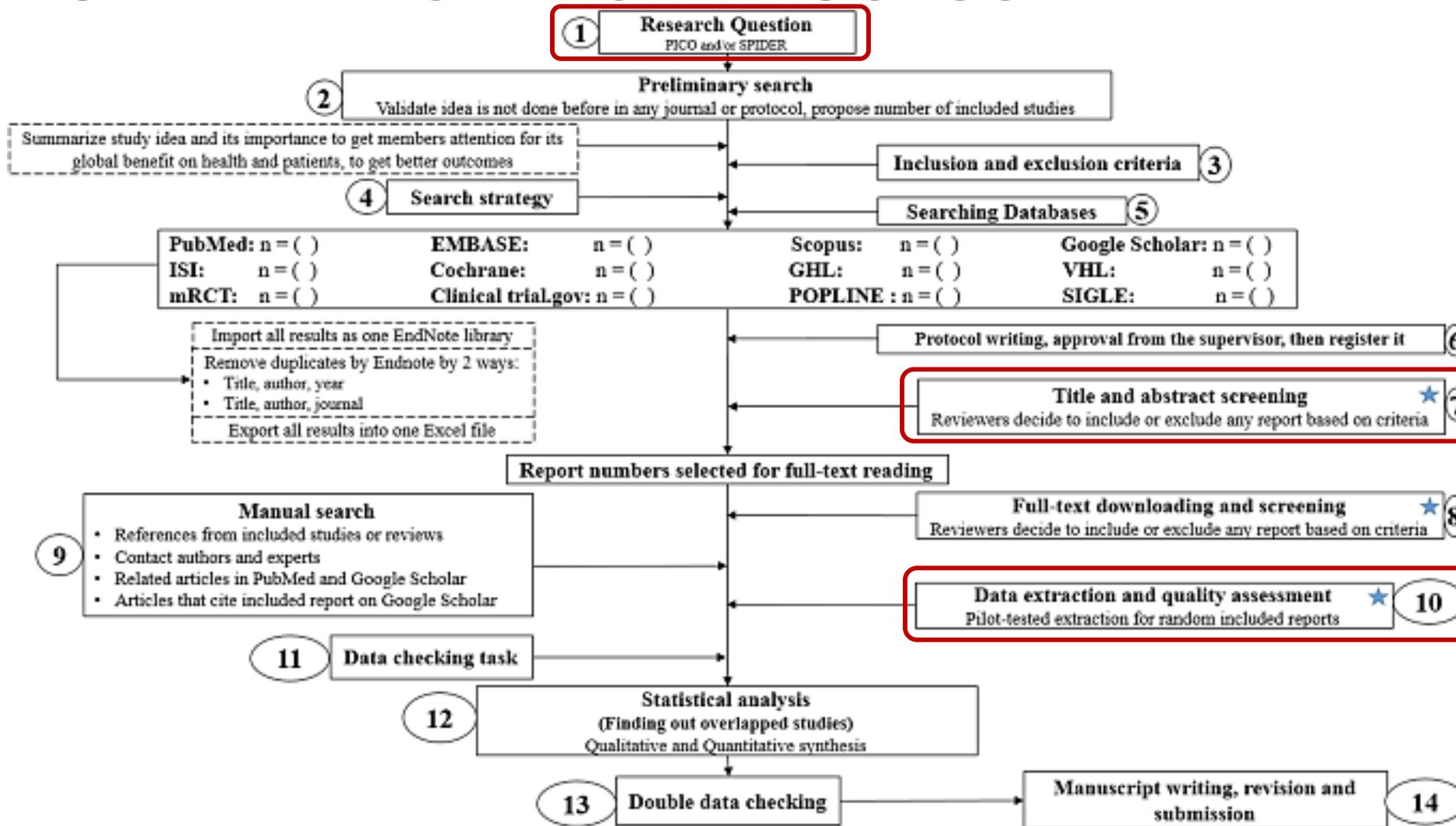
STUDY DESIGNS

FIGURE 1



Röhrig B, du Prel JB, Wachtlin D, Blettner M. Types of study in medical research: part 3 of a series on evaluation of scientific publications. *Dtsch Arztebl Int.* 2009 Apr;106(15):262-8. doi: 10.3238/arztebl.2009.0262. Epub 2009 Apr 10. PMID: 19547627; PMCID: PMC2689572.

FORMAL RESEARCH PROCESS



Tawfik GM, Dila KA, Mohamed MY, Tam DN, Kien ND, Ahmed AM, Huy NT. A step by step guide for conducting a systematic review and meta-analysis with simulation data. Tropical medicine and health. 2019 Dec;47(1):1-9.

TYPES OF HYPOTHESIS

- There are different types of hypothesis
- **Null**: states that there is no relationship between two variables.
- **Correlative**: establishes that there is a relationship between two or more variables.
 - It, however, does not specify the character/nature of such established relationship.
- **Directional**: implies the direction of relationship between two or more variables and such variables in directional hypothesis likely decrease or increase due to some factors.
- **Causal**: proposes a cause that affects relationship between two or more variables

EUREKA!

- Proposed research title for hands on:
- In medical students, does the integration of gamification into the curriculum, compared to the standard curriculum, improve knowledge retention?



PICO COMPONENTS

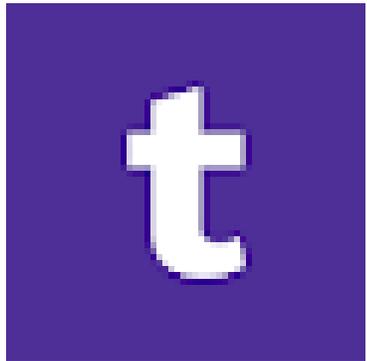


- **P - Patient/Population**
 - Medical students
- **I - Intervention/Exposure**
 - Use of gamification (e.g., points, leaderboards, interactive games)
- **C - Comparison**
 - Standard curriculum (traditional lectures)
- **O - Outcome**
 - Improved knowledge retention and academic performance

A top-down view of a wooden desk. On the left is a silver laptop. In the center is a white spiral-bound notebook with the text 'PREPARATION IS THE KEY' written in black marker. A yellow pencil lies on the notebook. To the right is a glass filled with several colored pencils. In the bottom left is a pair of black-rimmed glasses. In the bottom right is a tablet with a black screen. A white coffee cup is partially visible at the top center. A small potted plant is in the top right corner.

PREPARATION
IS THE KEY

BROWSER EXTENSIONS





tempmail chrome extension

All Videos Images Short videos Forums Web News Show more Tools

Chrome Web Store
https://chromewebstore.google.com › detail › inojafojbh...
Temp Mail - Disposable Temporary Email - Chrome Web Store
Temp Mail provides temporary, secure, anonymous, free, disposable email address. Forget about spam, advertising mailings, hacking and attacking robots.

Temp Mail
https://temp-mail.org › ...
Temp Mail - Disposable Temporary Email
Disposable email is a free email service that allows to receive email at a temporary address that self-destructed after a certain time elapses.

Chrome Web Store
https://chromewebstore.google.com › detail › ckcdnopgi...
Temp Mail - Disposable Temporary Email - Chrome Web Store
Temp Mail allows you to easily keep your email address clean and safe from spam and hackers by providing you temporary email.

Temp Mail
https://temp-mail.org › change
Change e-mail address
Temp Mail provides the ability to change your temporary email address on this page. To change or recover the email address, please enter the desired E-mail ...

HOW TO GET PREMIUM ACCOUNTS?

- These two websites currently working.





**BREAK
TIME !!**



1. PREPARING THE INITIAL DRAFT WITH HEADINGS

 **Ai2 Scholar QA** Beta

www.scholarqa.allen.ai

First Draft





Ai2 Scholar QA

A research tool for literature synthesis, with broad and deep coverage via a corpus of 8M+ full text papers and 108M+ abstracts. Ai2 Scholar QA can make mistakes. Check source documents by following citations. A project from [Ai2](#).

Ask a scientific review question



Want some inspiration? Try one of these examples:

[Compare two theories](#) • [Pretraining LLMs to code](#) • [Survey LLM ideation support systems](#) • [Non-linear UIs for LLMs](#) • [Pretraining 30B LLMs with GQA](#)

Scholarly tools



Discovery

Find papers in your field, from popular ones to more niche and hard-to-find



Synthesis

Ask a question and get a comprehensive answer that synthesizes and cites



More Coming Soon

We're actively developing new and exciting AI tools for

QUESTIONS...

- Do all the references truly exist? YES
- Are the inferences thoroughly valid? NO
- Can I use it to organize my manuscript headings?
YES
- Are the literature review comprehensively enough to
be used in manuscript? NO (about 70-80% coverage)

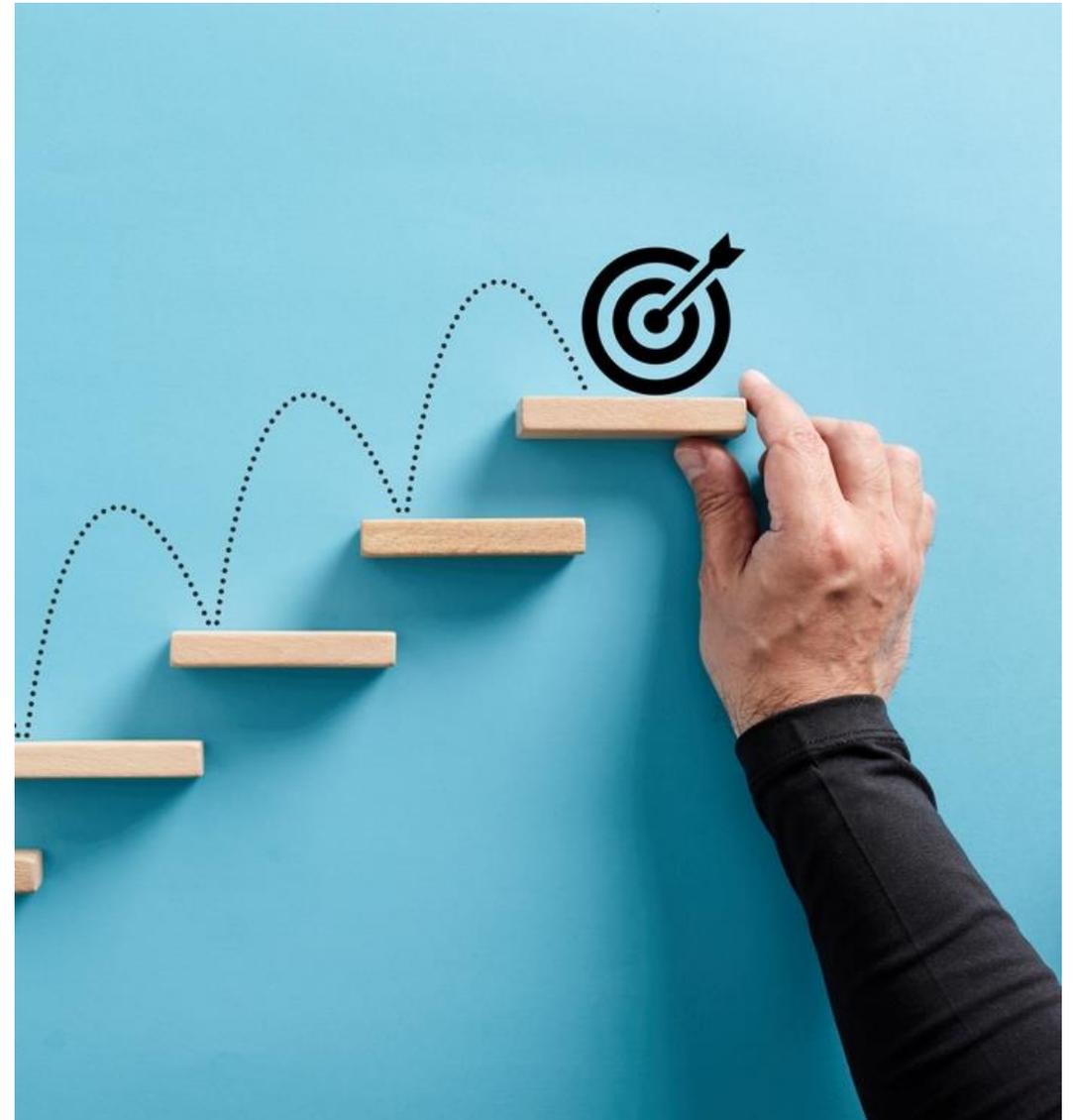


2. LITERATURE REVIEW ENRICHMENT



GOAL

- Finding almost all **influential** Interventional studies that assessed the impact of gamification on medical student knowledge retention.



LITERATURE REVIEW TOOLBOX

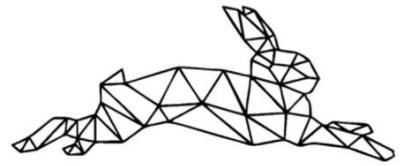
1

 Undermind

2

 Elicit

3


ResearchRabbit

LET'S PERFORM MORE COMPREHENSIVE LITERATURE REVIEW



2. UNDERMIND.AI



- Functionalities:
 - Comprehensive Searching

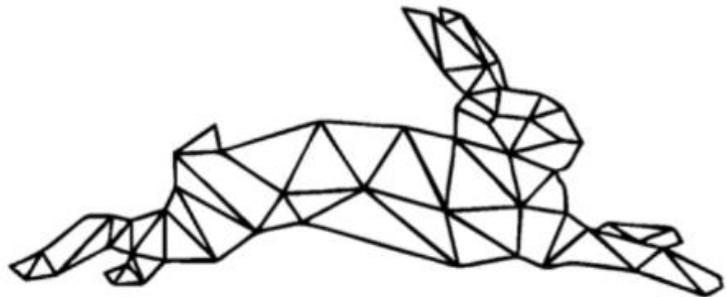
ELICIT



Elicit

- Functionalities:
 - Comprehensive Searching
 - Screening
 - Data Extraction

RESEARCH RABBIT



ResearchRabbit

- Functionalities:
 - Reference Tracking (Back and Forward)
 - Finalizing Literature Review

- New Collection
- New Category
- Import Zotero Collection

Uncategorized

+ Collection

- MS_VitaminD 2
- DOAC 2
- Enoxolone 7
- LLM Misinformation 4
- GUT+NK+MS 9
- Dr_Zare 1
- Dr_Hamidi 3
- Dr_Alavi 1
- Sadeghi 2
- Sequential Embryo Transfer 1
- CF 3
- Automaned ROB tool 1

Settings

Help

Survey

Follow

Donate

SUGGESTED REFERENCE MANAGER

zotero

Open source

Fast

Extensible

Journal referencing style templates

Q&A

